Hantek®

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CE

DSO1000SERIES
HANDHELD OSCILLOSCOPE

USER'S MANUAL
1060/1200/1600/1600H

www.hantek.com.cn

USER'S MANUAL

1060 / 1200 / 1600 / 1600H

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General Safety Notice

1. Safety Terms and Symbols

Terms in this manual:
These terms may appear in this manual:

WARNING: Warning statements identify conditions or practices that could result in injury or loss of life.

CAUTION: Caution statements identify conditions or practices that could result in damage to this product or other property.

Terms on the Product:
These terms may appear on the product:

DANGER: indicates an injury hazard may be immediately accessible.

WARNING: indicates an injury hazard may be not immediately accessible.

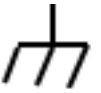
CAUTION: indicates that a potential damage to the instrument or other property might occur.

Symbols on the Product:
These symbols may appear on the product:

Hazardous Voltage

Refer to Instructions

Protective Earth Terminal


Grounding Terminal of Chassis

Test Grounding Terrninal

2. General Safety Information

Carefully read the following safety information in order to avoid any personal injury or damage on this product or any products connected with it. Review the following safety precautions carefully before operate the device to avoid any personal injuries or damages to the device and any products connected to it. To avoid potential hazards use the device as specified by this user's manual only.

■ **To Avoid Fire or Personal Injury.**

■ **Use Proper Power adapter.** Use only the power cord specified for this product and certified for the country of use.

- **Connect and Disconnect Properly.** Do not connect or disconnect probes or test leads while they are connected to a voltage source.

- **Connect and Disconnect Properly.** Connect the probe output to the measurement device before connecting the probe to the circuit under test. Disconnect the probe input and the probe reference lead from the circuit under test before disconnecting the probe from the measurement device.

- **Observe All Terminal Ratings.** To avoid fire or shock hazard, observe all ratings and markings on the product. Consult the product manual for further ratings information before making connections to the product.

- **Use Proper Probe.** To avoid shock hazard, use a properly rated probe for your measurement.

- **Avoid Circuit or Wire Exposure.** Do not touch exposed connections and components when power is on.

- **Do Not Operate With Suspected Failures.** If suspected damage occurs with the device, have it inspected by qualified service personnel before further operations.

- **Provide Proper Ventilation.** Refer to the installation instructions for proper ventilation of the device.

- **Do not operate in Wet/Damp Conditions.**

- **Do not operate in an Explosive Atmosphere.**

- **Keep Product Surfaces Clean and Dry.**

Digital Oscilloscopes

DSO1000 Series digital Oscilloscopes offer exceptional waveform viewing and measurements in a compact, lightweight package. DSO1000 series is ideal for production test, field service, research, design, education and training involving applications of analog circuit tests and troubleshooting.

Product features:

- **Dual Channel, Bandwidth:**

60MHz	(DSO1060)
200MHz	(DSO1200)
600MHz	(DSO1600)
600MHz	(DSO1600H)

- **Maximum real-time sampling rate:**
  250MSa/s (DSO1060)
  500MSa/s (DSO1200)
  1GSa/s (DSO1600)
  2GSa/s (DSO1600H)
- **Memory depth:**
  32K points (Single Channel), 16K points (Dual Channels)
- **Color TFT LCD, 320×240 pixels resolution.**
- **USB storage and printing supports, firmware upgrade via USB interface.**
- **Adjustable waveform intensity, more effective waveform viewing.**
- **One-touch automatic setup, ease of use (AUTOSET).**
- **15 Waveforms, 15 setups, supports CSV and bitmap format.**
- **22 Automatic measurements.**
- **Automatic cursor tracking measurements.**
- **Waveform recorder, record and replay dynamic waveforms.**
- **User selectable fast offset calibration.**
- **Built-in FFT function, Frequency Counter.**
- **Pass/Fail Function.**
- **Addition, Subtraction, Multiplication and Division Mathematic Functions.**
- **Advanced trigger types include: Edge, Pulse width,ALT,Video.**
- **Multiple Language User Interface.**
- **Pop-up menu makes it easy to read and easy to use.**
- **Built-in multi-language help system.**
- **Easy-to-use file system supports Multi-Language characters file name input.**
- **Selectable bandwidth limit:**
  DSO1060:20MHz
  DSO1200:20MHz,100MHz
  DSO1600:20MHz,100MHz,200MHz,350MHz
  DSO1600H:20MHz,100MHz,200MHz,350MHz

CHAPTER 1: Getting Start

This chapter covers the following topics:

- General Check
- Functional Check
- The User Interface
- Input Connections
- To compensate probes
- To display a signal automatically
- Using the Oscilloscope

General Check

When you have got a new DSO1000 series oscilloscope, it is suggested that you should perform a general inspection on the instrument according to the following steps:

■ **Check the shipping container for damage:**
Keep the damaged shipping container or cushioning material until the contents of the shipment have been checked for completeness and the instrument has been checked mechanically and electrically.

■ **Check the accessories:**
Accessories supplied with the instrument are listed in “Accessories” in this guide. If the contents are incomplete or damaged,please notify our distributor at your local area or the overseas sales dept.

■ **Check the instrument:**
In case there is any mechanical damage or defect, or the instrument does not operate properly or fails performance tests, please notify our distributor at your local area or the overseas sales dept.

User’s Interface

The first thing to do with a new oscilloscope is to know its front panel. This chapter helps to be familiar with the layout of the keys and how to use them. Read this chapter carefully before further operations.

Front Panel (Figure 1-1):

The buttons not only allow you to use some of the functions directly but also bring up the manual keys on the screen, which enable the access to many measurement features associated with advanced functions, mathematics, and reference or to run control features.

Figure 1-1 Oscilloscope Front Panel

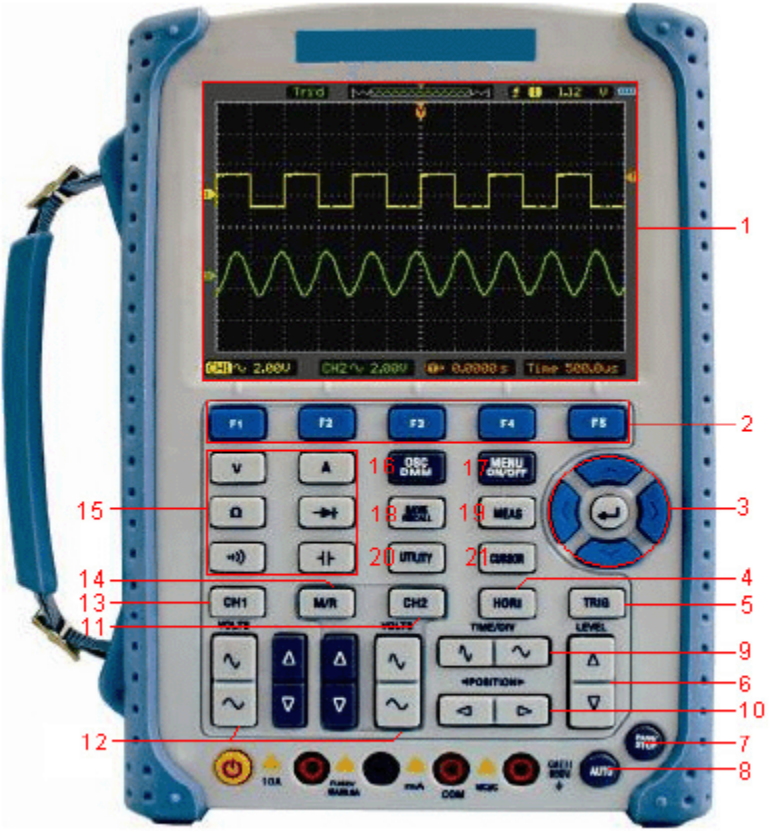


Figure 1-2 Front Panel Description

Description

1. LCD Display
2. **F1~F5**: Sets or switch options for the menu
3. Arrow Keys
4. **HORI**: Shows Horizontal menu
5. **TRIG**: Shows Trigger menu
6. **LEVEL**: Adjust the trigger level
7. **RUN/STOP**: key for running or stopping the operation
8. **AUTO**: Be used for auto setting under the oscilloscope operation mode

9. **TIME/DIV**: Decrease or Increase the time base
10. **POSITION**: Adjust the horizontal trigger position
11. **CH2**: Shows the CH2 menu
12. **VOLTS**: Decrease or Increase the voltage/div
13. **CH1**: Shows the CH1 menu
14. **M/R**: Shows the Math or REF menu
15. **DMM Buttons**: The DMM control buttons
16. **DMM/SCOPE**: Switch DMM or Scope function
17. **MENU ON/OFF**: Turn on/off the menu
18. **SAVE RECALL**: Shows SAVE or RECALL menu
19. **MEAS**: Shows Measurement menu
20. **UTILITY**: Shows Utility menu
21. **CURSOR**: Shows Cursor menu

Display screen

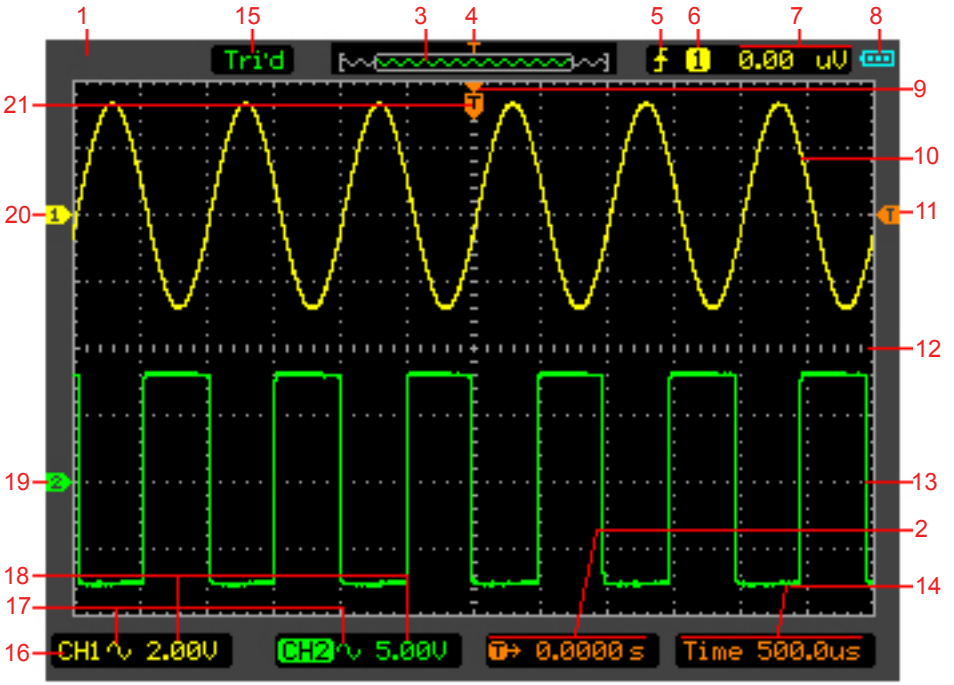


Figure 1-3 LCD Display screen

Description

1. Shows Brand

2. Shows horizontal trigger time
3. Shows location of the current waveform in the memory
4. Shows the trigger position in the memory
5. Shows the trigger mode
6. Shows the trigger source
7. Shows the trigger level
8. Shows the power
9. The center of current waveform window
10. CH1 waveform
11. The trigger level symbol
12. The grid
13. CH2 waveform
14. Shows the time base
15. Shows running staturs
16. CH1/CH2
17. Shows the coupling
18. Shows the voltage/div
19. CH2 mark
20. CH1 mark
21. Shows the trigger position in current waveform window

Input Connections

See the following Figure 1-4:

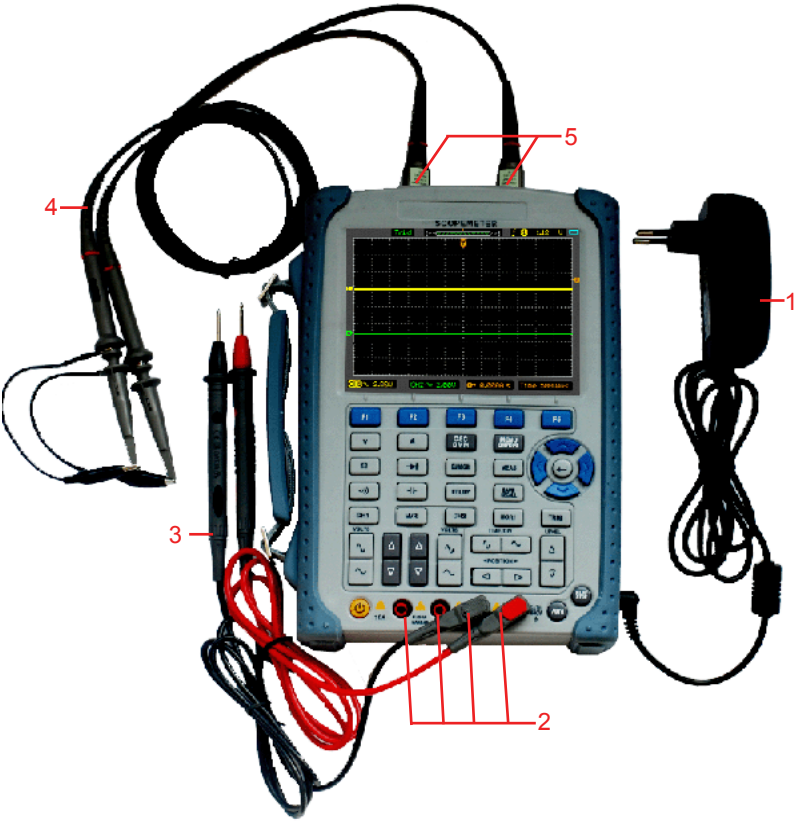


Figure 1-4 Input Connections

Description:

1. The power adapter is supplied for AC power supply and battery recharging.
2. Multi-meter input jacks, including four circular banana jacks .The four circular jacks are used for voltage,resistance,mA range current and A range current inputs.
3. Multi-meter test lead.
4. Oscilloscope probes.
5. Oscilloscope input channels.

Function Check

Perform this quick functional check to verify that your oscilloscope is operating correctly.

1. Turn on the instrument.

Use the power adapter designed for your oscilloscope only. Use a power source that delivers 100 to 240 VACRMS, 50Hz. Turn on the oscilloscope.

2. Input a signal to a channel.

Set the attenuation switch on the probe to X10 and connect the probe to CH1 on the oscilloscope.

To do this:

- Align the slot in the probe connector with the key on the CH1 BNC connector.
- Push to connect, and twist to the right to lock the probe in place.
- Attach the probe tip and ground lead to the PROBE COMP connector.

Set the probe attenuation of the oscilloscope to 10X.To do this, push CH1→Probe→10X .

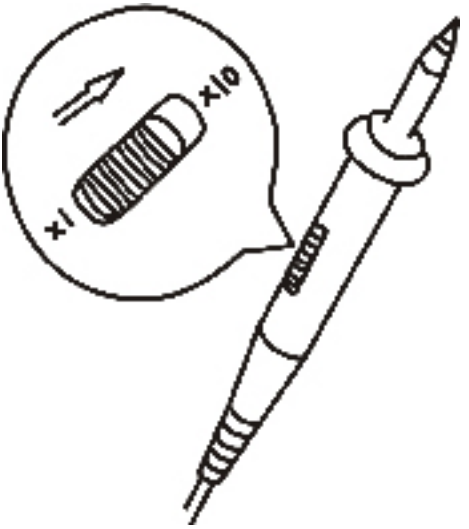


Figure 1-5 Set the probe

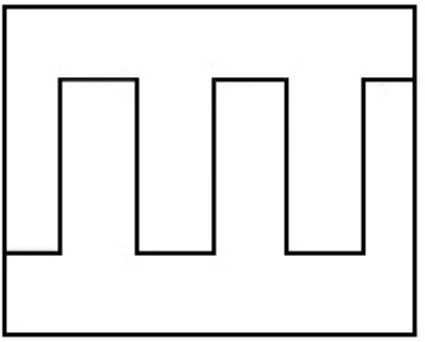
3. Push the **AUTO** button. Within a few seconds, a square wave will display (approximately 1 kHz 2 V peak- to- peak).

Turn off CH1 and turn on CH2, repeat steps 2 and 3.

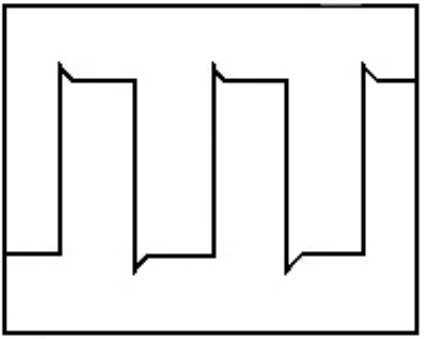
To compensate probes

Perform this adjustment to match the characteristics of the probe and the channel input. This should be performed whenever attaching a probe to any input channel the first time.

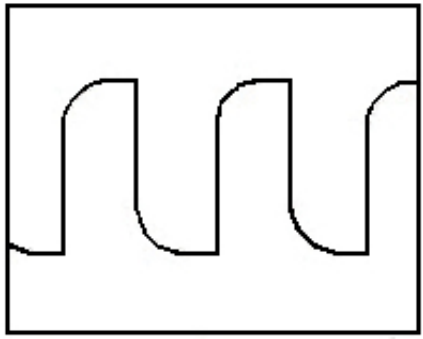
1. From CH1 menu, set the probe attenuation to 10X (press **CH1→Probe→10X**).
   Set the switch to X10 on the probe and connect it to CH1 of the oscilloscope.
   When using the probe hook-tip, insert the tip onto the probe firmly to ensure proper connection.
   Attach the probe tip to the probe compensator connector and the reference lead to the ground pin, Select CH1, and then press AUTO.
2. Check the shape of the displayed waveform.



Correctly Compensated



Over compensated



Under Compensated

3. If necessary, use a non-metallic tool to adjust the trimmer capacitor of the probe for the flattest square wave being displayed on the oscilloscope.

4. Repeat if necessary.

WARNNING: To avoid electric shock while using the probe, be sure the perfection of the insulated cable, and do not touch the metallic portions of the probe head while it is connected with a voltage source.

To display a signal automatically

The oscilloscope has an Auto feature that automatically sets up the oscilloscope to best display the input signal. Using Auto requires signals with a frequency greater than or equal to 50 Hz and a duty cycle greater than 1%.

Press the AUTO button, the oscilloscope turns on and scales all channels that have signals applied, and it selects a time base range based on the trigger source. The trigger source selected is the lowest numbered input that has a signal applied. The oscilloscope has two-channels input . Connect a signal to the CH1 input.

1.Connect a signal to the oscilloscope.
2.Press AUTO.

The oscilloscope may change the current setting to display the signal. It will automatically adjust the vertical and horizontal scaling, the trigger coupling, type, position, slope, level, and mode settings.

Using the Oscilloscope

This part provides a step-by-step introduction to the scope functions. The introduction does not cover all of the capabilities of the scope functions but gives basic examples to show how to use the menus and perform basic operations.

Turn on the oscilloscope

Connect oscilloscope to AC power via a power adapter. (The oscilloscope can still work with built-in Li-ion battery even without AC power supply.)
Turn the oscilloscope on by pressing down the power on/off key.
The instrument then performs Self-checking after power on. The welcome picture will display on the screen when the system finishes Self-checking.
The oscilloscope is powered up in its last setup configuration.

Figure 1-6 The Login window

Menu Operation

The following example shows how to use the tools menus to select a function, as shown in the following figure.

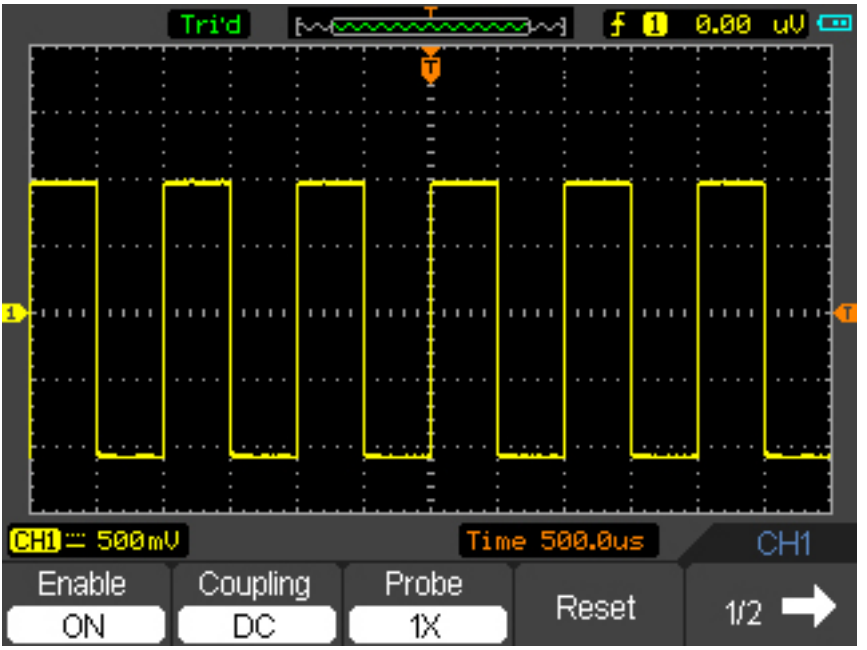


Figure 1-7 The Menu

1. Press the **MENU ON/OFF** key to display the Function Menu on the bottom of the screen and the corresponding optional settings on the bottom. Press **MENU ON/OFF** again to hide the Function Menu.
2. Choose one key from **F1** to **F5** and press it to change function setting.

Set up the vertical system

1. Change the vertical setup and notice that each change affects the status bar differently.

- Change the vertical sensitivity with ~ or ∿ button and notice the change in the status bar.

2. Move the signal vertically.

- The △ / ▽ button moves the signal vertically. Also notice that the channel symbol on the left side of the display moves in conjunction with the button.

To set up the horizontal system

1. Change the time base.

■ The ~ or ∿ button changes the time base in a 1-2-5 step sequence, and displays thevalue in the status bar.

2. Move signal horizontally.

■ The ◁ or ▷ button moves displayed signal horizontally on waveform window. It sets the trigger point position.

Set up the trigger system

1. Change the trigger Level

■ The △ or ▽ button changes the trigger level. The trigger level value is displayed at the top-right of the screen and a line is displayed showing the location of the trigger level.

2. Change the trigger setup and notice these changes in the status bar.

■ Press **TRIG** button in the key panel.Choose one key from F1 to F5 and press it to change function setting.

CHAPTER 2: Operating Scope

The end user should know how to determine the system setup from the status bar of a Oscilloscope. This chapter will detail the oscilloscope function of the test tool.

- Set Vertical System
- Set Horizontal System
- Set Trigger System
- Save and Recall waveforms and setups
- Utility Function
- Measure Signal
- Cursor Measure

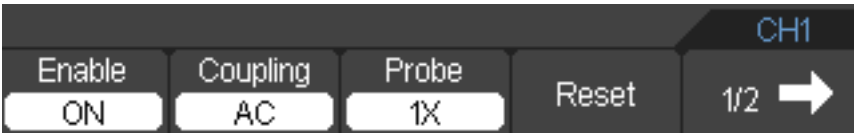
Set Vertical System

Each channel of Oscilloscope has its own independent operation menu and it will pop up after pressing CH1 or CH2 button. The settings of all items in the menu are shown in the table below.

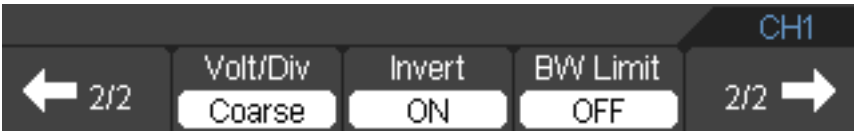
To make vertical CH1 and CH2 settings, do the following:

1. Press the CH1 or CH2 button and then the function menu appears at the bottom of the screen.
2. Select and press key from F1 to F5 keys to make different settings.

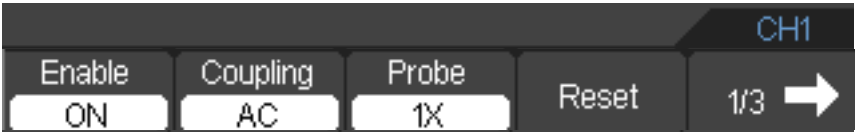
Now, you can find the menu that looks like the following figure 2-1.
The CH1 menu (Page 1/2)



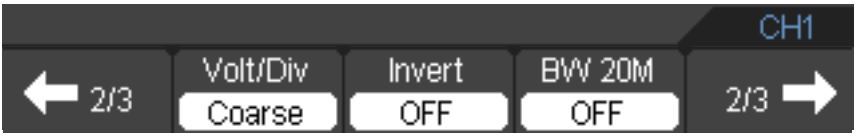
The CH1 menu (Page 2/2)



The CH1 menu (Page 1/3)(not include DSO1060)



The CH1 menu (Page 2/3)(not include DSO1060)



The CH1 menu (Page 3/3)(not include DSO1060)

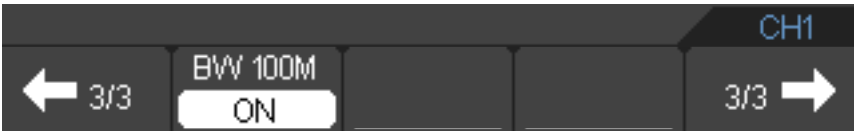


Figure 2-1 The CH1 Menu

The following table describes the channel menu:

Menu	Setting	Description
Enable	ON OFF	Turn on Channel Turn off Channel
Coupling	AC DC GND	The dc component in the input signal is blocked The ac and dc components of the input signal are allowed Disconnect the input signal
Probe	1X 10X 100X 1000X	Select one according to the probe attenuation factor to ensure correct vertical scale reading
Reset		Set the vertical display position back to middle window
1/2 ⇨		Go to the next menu page
2/2 ⇦		Back to the previous menu page
Volt/Div	Coarse Fine	Set Voltage range coarsely Set Voltage range finely
Invert	ON OFF	Turn on the invert function Turn off the invert function
BW 20M	ON OFF	Turn on the BW 20M(not include DSO1060) Turn off the BW 20M
2/2 ⇨		Back to the previous menu page
3/3 ⇨		Go to the next menu (not include DSO1060)
BW 100M		Turn on the BW 100M(not include DSO1060) Turn off the BW 100M
3/3 ⇦		Go to the first menu(not include DSO1060)

BW Limit		Turn on the BW Limit Turn off the BW Limit

1. Change Volt/DIV

It is the default setting of Volts/Div in a 1-2-5-step sequence from 1mV/div,2mV/div,5mV/div or 10mV/div, 20mV/div, 50mV/div,..., to 1V/div,2 V/div,5 V/div.
The Volt/DIV will be displayed in the status bar on the bottom of the screen.

Figure 2-2 Channel Volt/Div

Press CH1→Volt/Div→Coarse/Fine to Set Volt/Div range.

2. Set Channel Coupling

With CH1 taken for example, input a sine wave signal containing a dc offset.
Press CH1→Coupling→AC to set “AC” coupling. It will pass AC component but block the DC component of the input signal.
The waveform is displayed as Figure 2-3

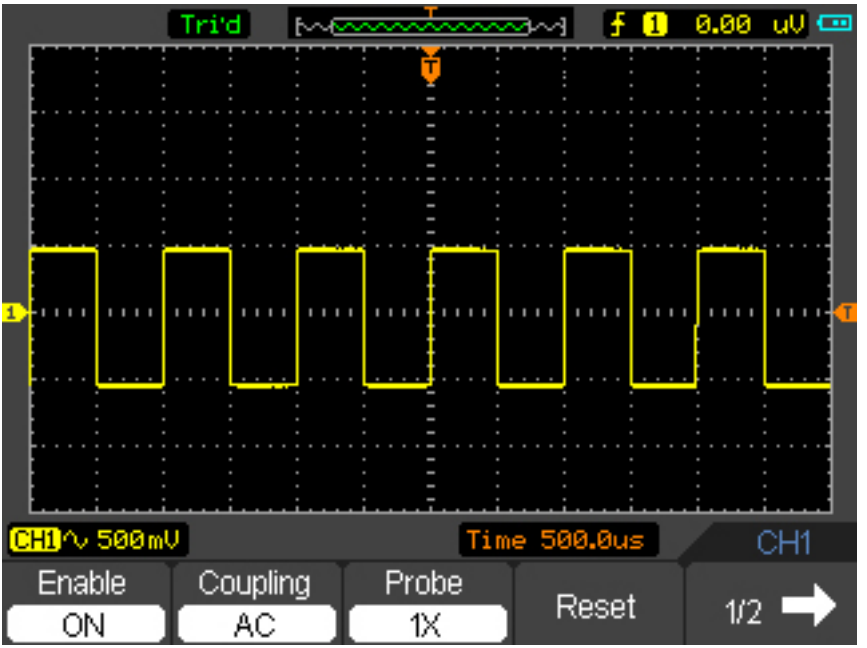


Figure 2-3 Waveform Display

Press CH1→Coupling→DC, to set “DC” coupling. It will pass both AC and DC components of the input signal.
The waveform is displayed as Figure 2-4.

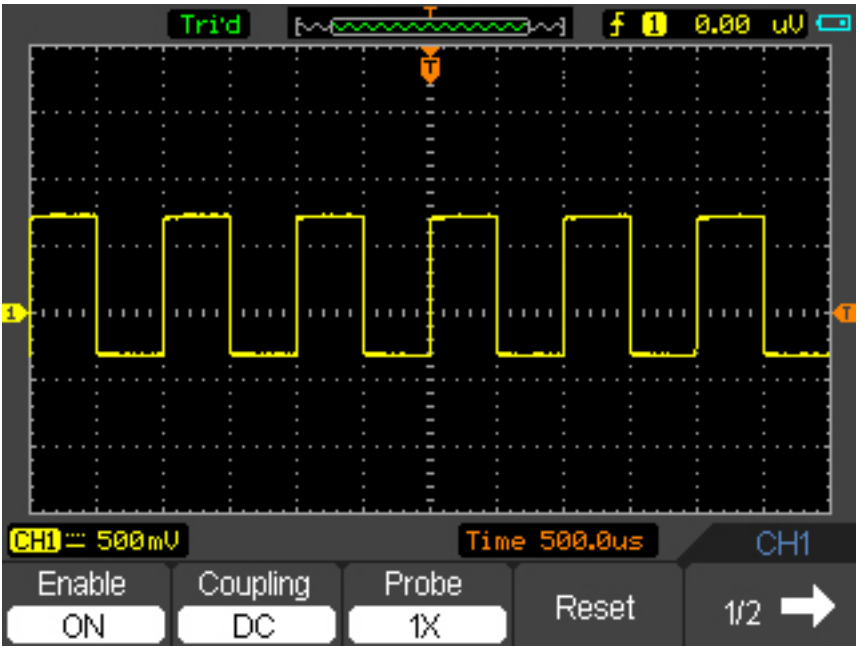


Figure 2-4 Waveform Display

Press CH1→Coupling→GND, to set "GND" coupling, it disconnects the input signal. The screen displays as Figure 2-5:

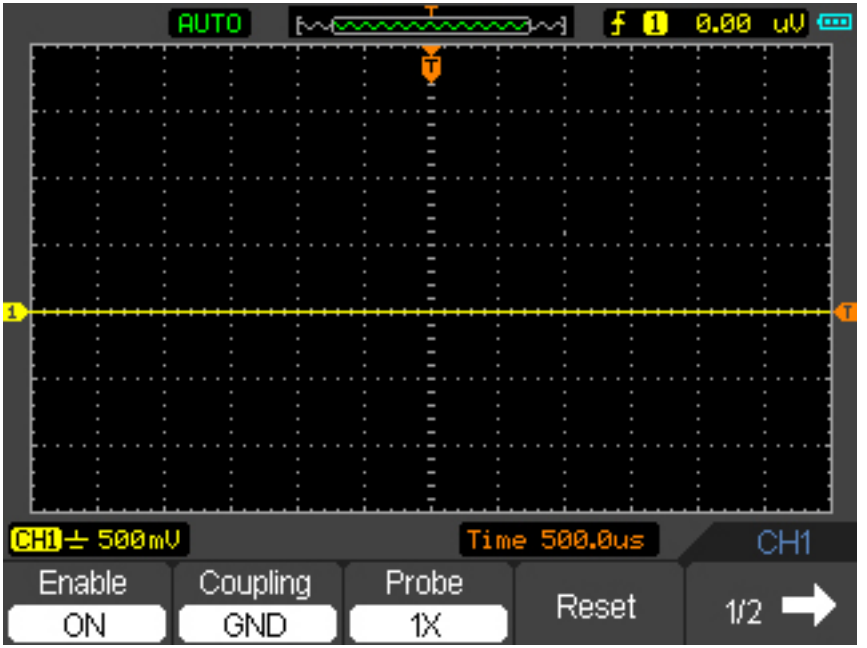


Figure 2-5 Waveform Display

3. Set Probe Attenuation

The oscilloscope allows adjusting the probe attenuation scale factor correspondingly in the channel operation menu in order to comply with the probe attenuation scale. The attenuation factor changes the vertical scaling of the oscilloscope so that the measurement results reflect the actual voltage levels at the probe tip.
To change (or check) the probe attenuation setting, press the CH1 or CH2 button (according to which channel in using). Toggle the Probe soft button to match the attenuation factor of the probe.

This setting remains in effect until changes again.

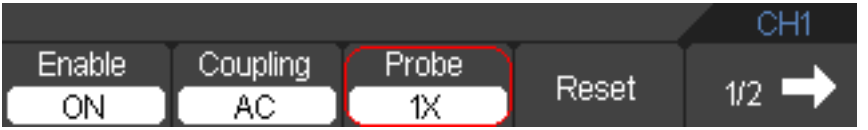


Figure 2-6 Probe Setting

4. Invert a waveform

The displayed waveform reverses 180 degrees relatively to the ground potential.
Press CH1 or CH2 → F5 → F3, to turn on/off the Invert.

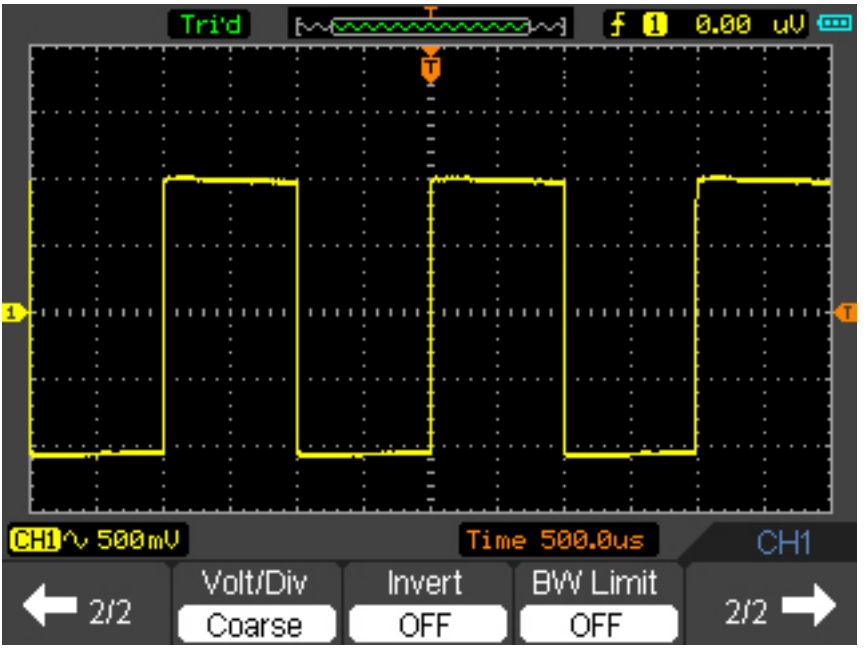


Figure 2-7 Turn Invert off

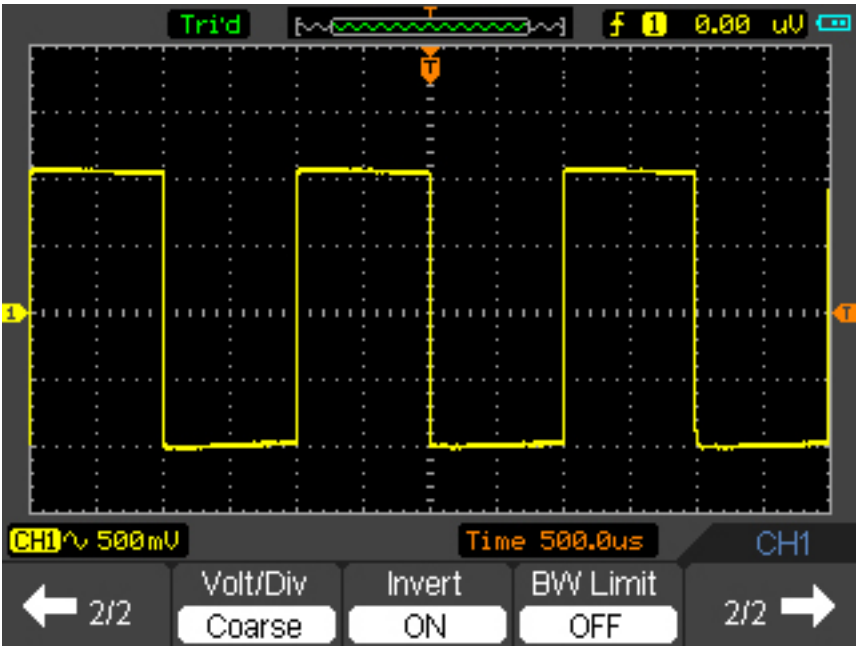


Figure 2-8 Turn Invert on

5. Set Band-Width Limit

With CH1 taken for example, input a signal containing high frequency component.

Press CH1→F5→F4→OFF, to set up bandwidth limit to “OFF” status. The oscilloscope is set to full bandwidth and passing the high frequency component in the signal. The waveform is displayed as Figure 2-9.

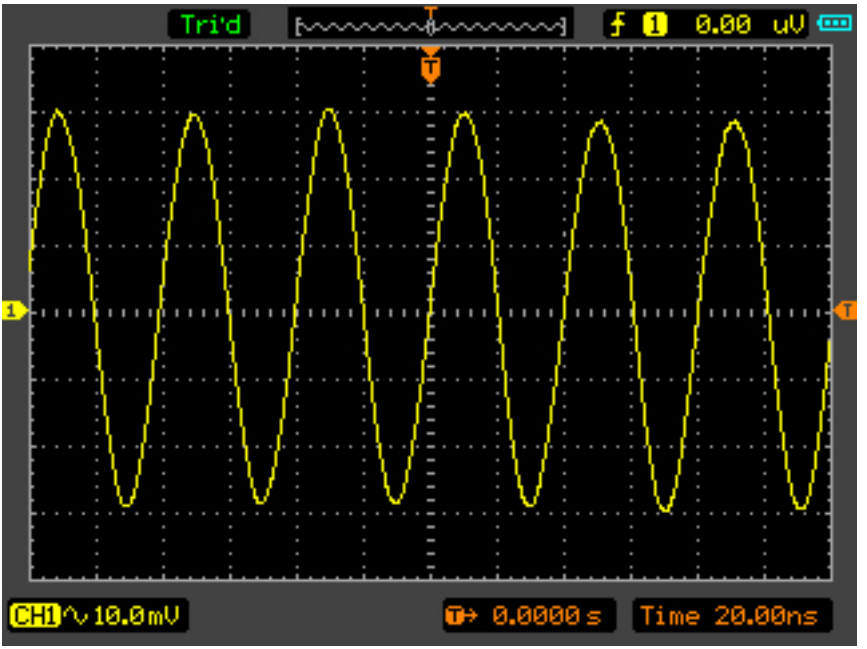


Figure 2-9 Turn BW limit Off

Press CH1→F5→F4→ON, to set up bandwidth limit to "ON" status. It will reject the frequency component higher than 20MHz.

Press CH1→F5→F5→F2→ON, to set up bandwidth limit to "ON" status. It will reject the frequency component higher than 100MHz.This function is not used in DSO1060.
The waveform is displayed as Figure 2-10:

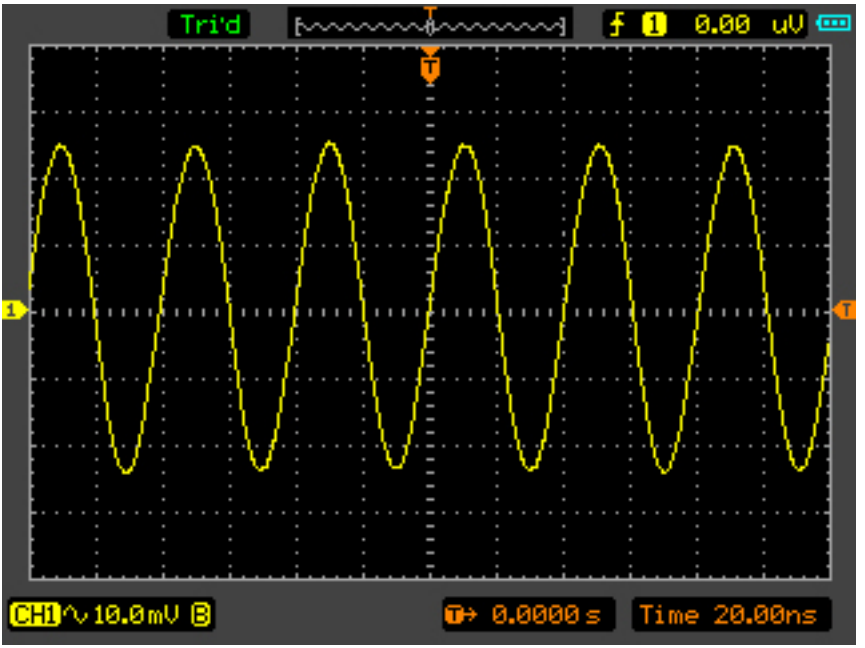


Figure 2-10 Turn BW limit On

6. Math Setting

The mathematic functions include “add”, “subtract”, “multiply”, “division”, and “FFT” for CH1 and CH2. The mathematic result can be measured by the grid and the cursor. The mathematic window is displayed as figure 2-11.

The Math menu (Page 1/2)

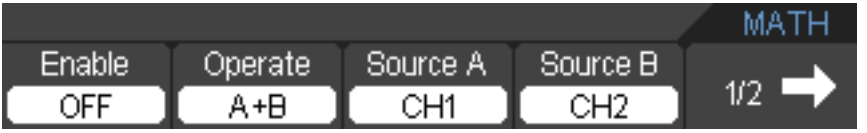


Figure 2-11 The Math menu

The Math menu (Page 2/2)

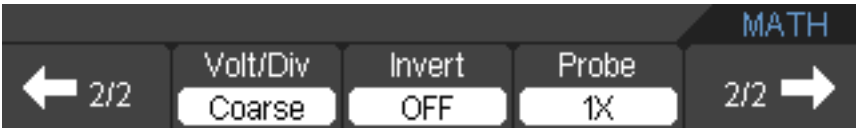


Figure 2-12 The Math menu

The Math menu setting table

Menu	Setting	Description
Enable	ON OFF	Turn on math Turn off math
Operate	A + B A - B A X B A / B FFT	Add source A and source B Subtract source B from source A Multiply source B by source A Divide source A by source B Fast Fourier Transform
Source A	CH1 CH2	Define CH1 or CH2 as source A
Source B	CH1 CH2	Define CH1 or CH2 as source B
1/2 ⇨		Go to the next menu page
2/2 ⇦		Back to the previous menu page
Volt/Div	Coarse Fine	Set Voltage range coarsely Set Voltage range finely
Invert	ON OFF	Invert the MATH waveform Waveform display normal
Probe	1x 10x 100x 1000x	Select one according the probe attenuation factor to ensure a correct vertical scale reading
2/2 ⇨		Back to the previous menu page

Addition, Subtraction, Multiplication,Division and FFT
In the Math function, use the addition, subtraction, multiplication,division and FFT to operate and analyze the waveform.
The multiplication function window is displayed in figure 2-13

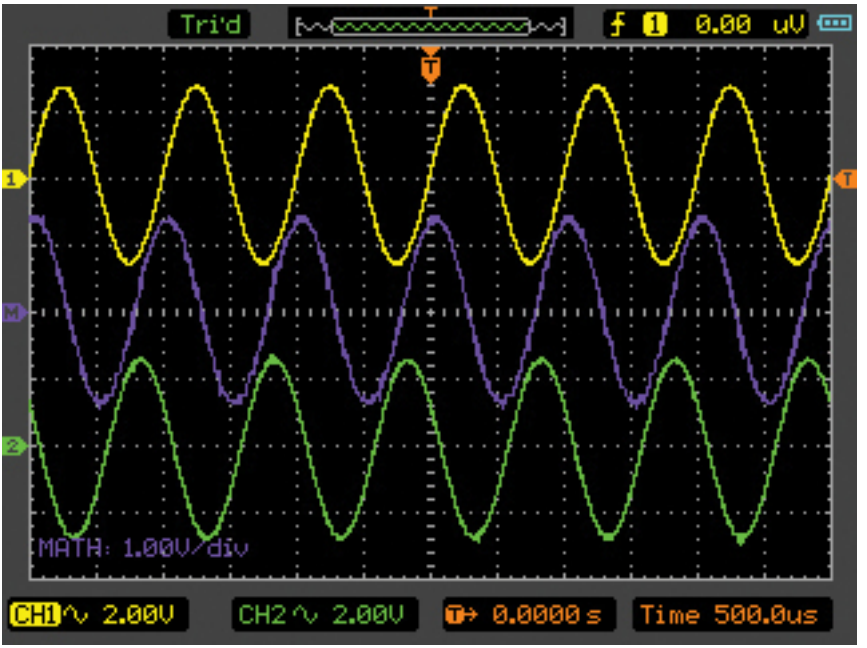


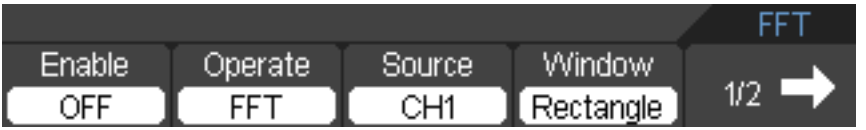
Figure 2-13 The multiplication

7. FFT

The FFT (Fast Fourier Transform) process converts a time-domain signal into its frequency components mathematically.

FFT waveforms are useful in the following applications:
- Measure harmonic content and distortion in systems
- Characterize noise in DC power supplies
- Analyze harmonics in power lines

The FFT menu (Page 1/2)



The FFT menu (Page 2/2)

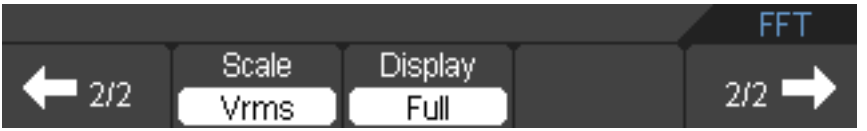


Figure 2-14 The FFT menu

The FFT menu table

Menu	Setting	Description
Enable	ON OFF	Turn on FFT Turn off FFT
Operate	FFT	Fast Fourier Transform
Source	CH1 CH2	Define CH1 or CH2 as FFT source
Window	Rectangle Hanning Hamming Blackman	Select window for FFT
1/2 ⇨		Go to the next menu page
2/2 ⇦		Back to the previous menu page
Scale	Vrms dBVrms	Set "Vrms" as vertical unit Set "dBVrms" as vertical unit
Display	Full Split	Display waveform in full screen Display waveform in split screen
2/2 ⇨		Back to the previous menu page

Note:

1. Signals that have a DC component or offset can cause incorrect FFT waveform component magnitude values. To minimize the DC component, choose AC Coupling on the source signal.
2. To reduce random noise and aliases components in repetitive or single-shot events, set the oscilloscope acquisition mode to average.
3. To display FFT waveforms with a large dynamic range, use the "dBVrms" scale. The "dBVrms" scale displays component magnitudes using a log scale.

FFT Window

The oscilloscope provides four FFT windows. Each window is a trade-off between frequency resolution and amplitude accuracy. It depends on the desired

measurement and the source signals characteristics to determine the window to use. Use the following guidelines to select the best window.

The FFT Window table

Window	Features	Best for measuring
Rectangle	Best frequency resolution and worst magnitude resolution.This is essentially the same as no window.	Transients or bursts, the signal levels before and after the event are nearly equal.Equal-amplitude sine waves with fixed frequencies. Broadband random noise with a relatively slow varying spectrum.
Hanning Hamming	Better frequency, poorer magnitude accuracy than Rectangular. Hamming has slightly better frequency resolution than Hanning.	Sine, periodic, and narrow-band random noise. Transients or bursts where the signal levels before and after the events are significantly different.
Blackman	Best magnitude, worst frequency resolution.	Single frequency waveforms, to Find higher order harmonics.

8. REF

Reference Waveforms are saved waveforms to be selected for display. The reference function will be available after saving the selected waveform to non-volatile memory.
Press M/R button to display the Reference waveform menu.
Select menu Enable->ON to enter reference function window. The reference function window is displayed in Figure 2-15.

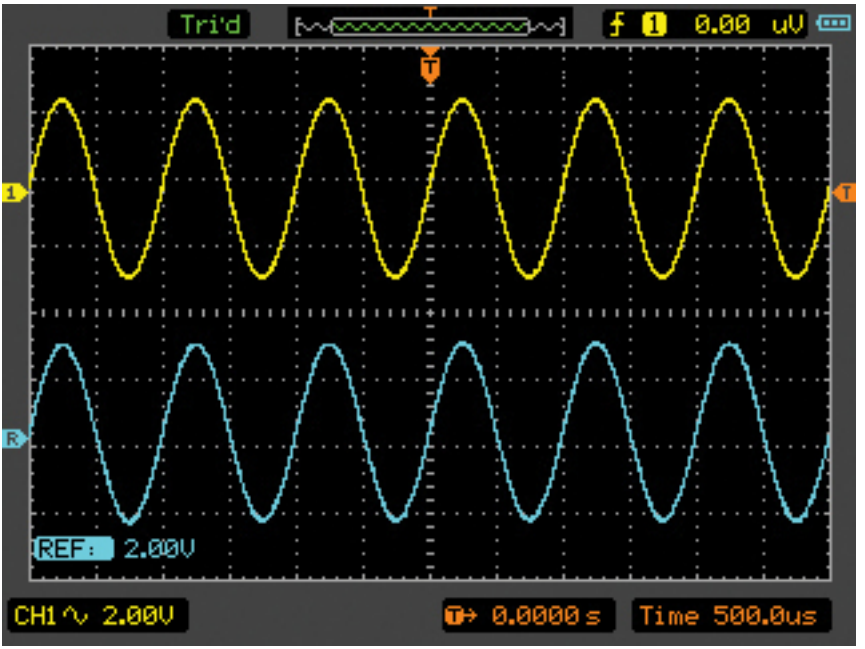


Figure 2-15 The reference function window

Internal

Press M/R → REF → Internal and go to the following menu.

REF menu when using internal memory

Figure 2-16 The Internal menu

REF menu table when using internal memory

Menu	Setting	Description
Enable	ON OFF	Turn on REF Turn off REF
Source	CH1 CH2 MATH	Select CH1 as REF channel Select CH2 as REF channel Select MATH as REF channel

Location	Internal External	Select memory location in scope Select memory location out scope
Save		Save REF waveform
Load		Load REF waveform

REF menu table when using external memory

Menu	Setting	Description
Enable	ON OFF	Turn on REF Turn off REF
Source	CH1 CH2	Select CH1 as REF channel Select CH2 as REF channel
Location	Internal External	Select inner memory location Select outer memory location
1/2 ⇨		Go to the next menu page

External

Press M/R→REF→External and go to the following menu.

The External REF menu (Page 1/2)

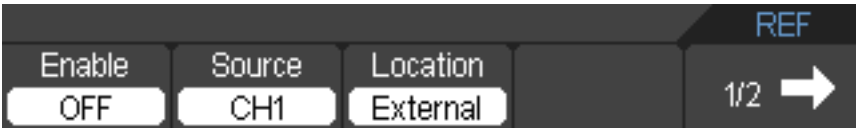


Figure 2-17 The External menu

The External REF menu (Page 2/2)

Figure 2-18 The External menu

The External menu table

Menu	Setting	Description
New File		To create a file
Delete File		To delete the chosen file

Load		To load a chosen file
⇨		Go to the Storage menu page

Display a Reference Waveform

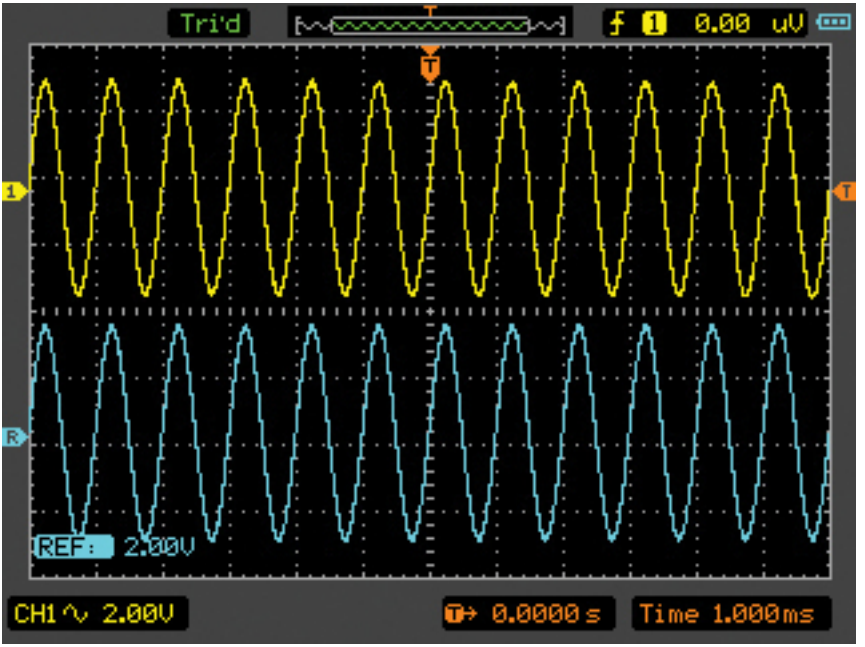


Figure 2-19 Reference display

1. Press M/R button to show the reference waveform menu.
2. Press F2 to select the reference channel: CH1, CH2 or MATH.
3. Press F4 to save REF.
4. Press F5 to load an internal REF file.
5. Press F1 button to turn on REF.

Note:
The Reference function is not available in X-Y mode.

Set Horizontal System

The horizontal system changes the horizontal scale and position of waveforms. The horizontal center of the screen is the time reference for waveforms. Changing the horizontal scale causes the waveform to expand or contract with respect to the screen

center.
Horizontal position changes the displayed waveform position, relative to the trigger point. Press HORI button to show the horizontal system menu. The settings of this menu are listed in the following table.

The Horizontal Menu

Figure 2-20 The Horizontal menu

The Horizontal Menu Table

Menu	Setting	Description
Time base	Y – T X – Y Roll	Show the relative relation between vertical voltage and horizontal time. Show CH1 value at X axis; CH2 value at Y axis. In Roll Mode, the waveform display updates from right to left.
Reset		Pressing this button clears trigger offset and moves the trigger point to the horizontal center of the screen.
ALT Mag	ON OFF	Turn on ALT Mag Turn off ALT Mag
Holdoff	ON OFF	Turn on the Holdoff time Turn off the Holdoff time

1. TIME/DIV

Use this button to select the horizontal time/div (scale factor) for the main.

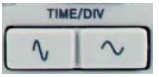


Figure 2-21 The TIME/DIV button

2. POSITION

Press this button to adjust the horizontal position of all channel waveforms. The resolution of this control varies with the time base.

Figure 2-22 The POSITION button

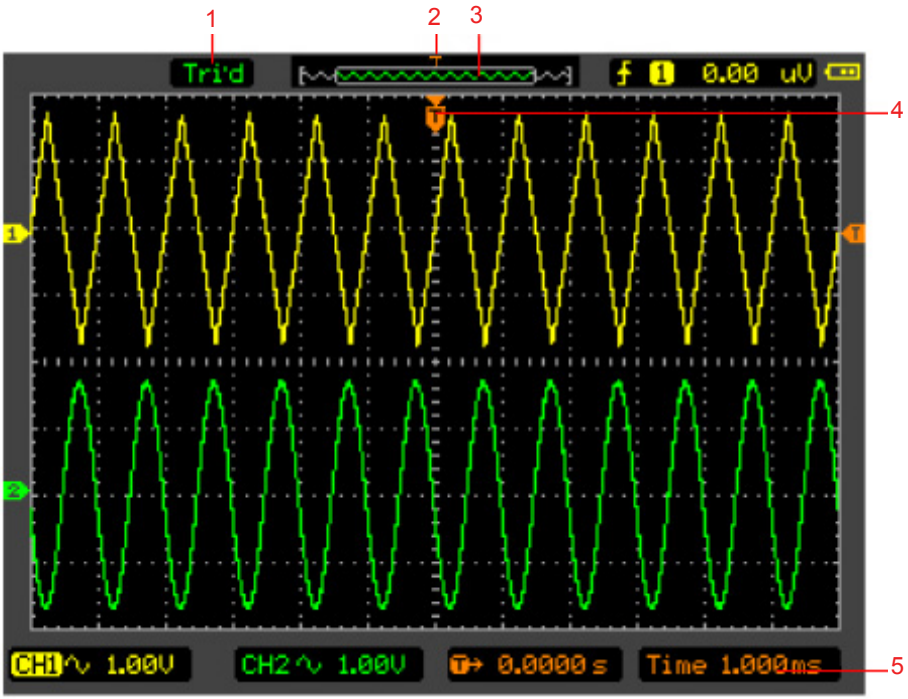


Figure 2-23 The horizontal/Time base marks

Marks Indicator

1. The current running status.
2. The trigger position in the memory.
3. The current waveform window's position in the memory.
4. The trigger position in the current waveform window.
5. The horizontal time base (main time base).

ALT Mag

The ALT Mag is a magnified portion of the waveform window. Use ALT Mag to locate and horizontally expand part of the main waveform window for a more detailed (higher horizontal resolution) analysis of signal. The ALT Mag time base setting cannot be set .

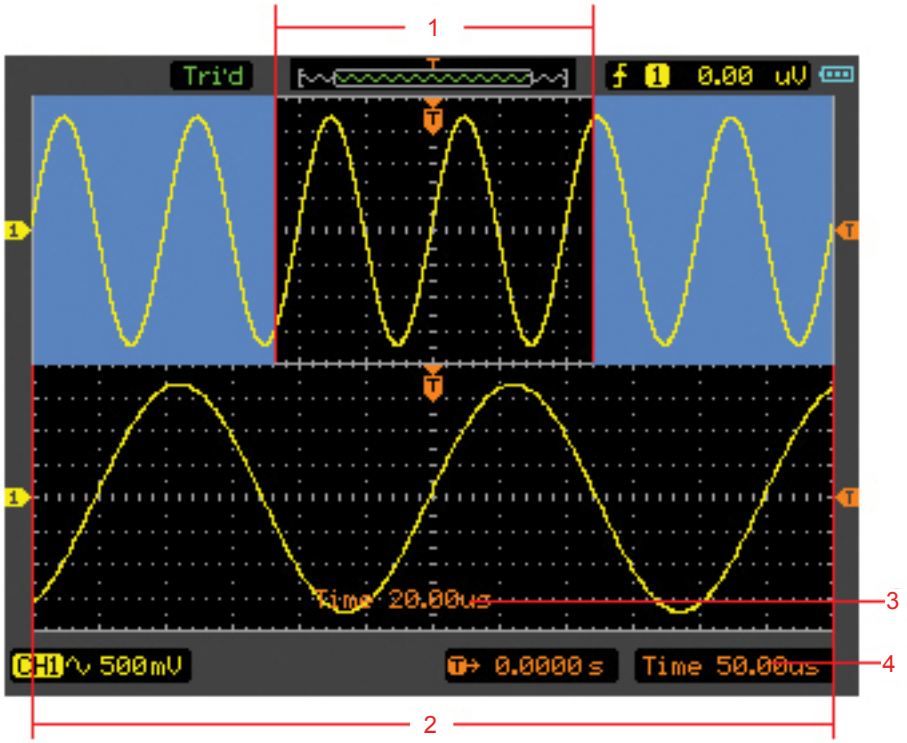


Figure 2-24 ALT Mag Mode

Description:
1. Wave to be horizontally expanded.
2.The magnified Wave.
3.The time base of ALT Mag.
4.The main time base.

The following describes the ALT Mag display.

The screen is divides into two parts. The upper half displays the main waveform window and the lower half displays an expanded portion of the main waveform window.This expanded portion of the main window is called the ALT Mag window.Two blocks shadow the upper half. The un-shadowed portion is expanded in the lower half. The key TIME/ DIV control the size and position of the ALT Mag. The symbol at the right bottom of the screen means the main time base and the symbol on the center bottom means the ALT Mag time.

X-Y Format

This format is useful for studying phase relationships between two signals. CH1 in the

horizontal axis (X) and CH2 in the vertical axis (Y)

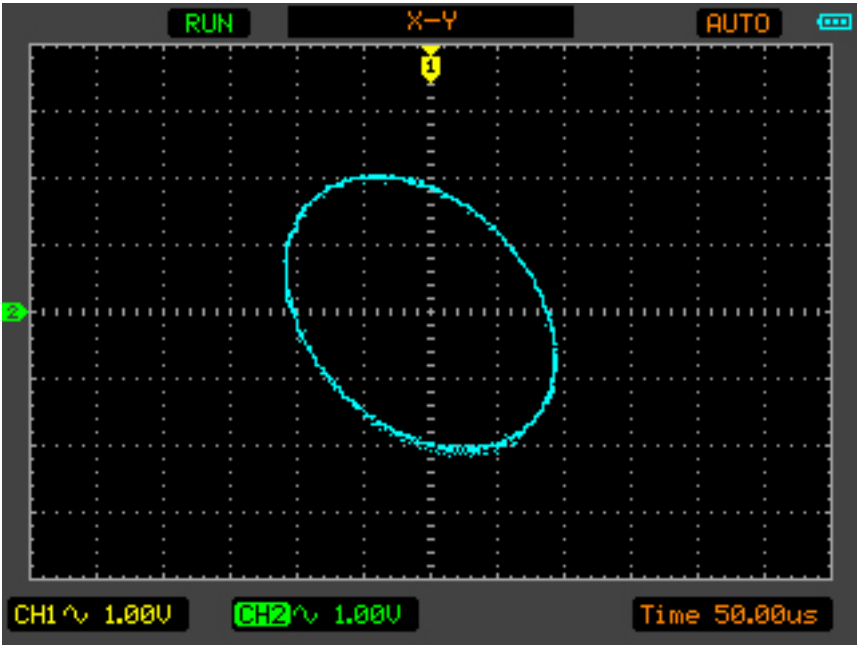


Figure 2-25 X-Y display format

The following modes or functions will not work in X-Y format.

- Automatic Measurements
- Cursor Measurements
- REF and MATH Operations
- Horizontal Position
- Trigger Controls

Set Trigger System

The trigger determines when the oscilloscope starts to acquire data and display a waveform. When a trigger is set up properly, it can convert unstable displays or blank screens into meaningful waveforms.

When the oscilloscope starts to acquire a waveform, it collects enough data so that it can draw the waveform to the left of the trigger point. The oscilloscope continues to acquire data while waiting for the trigger condition to occur. After it detects a trigger, the oscilloscope continues to acquire enough data so that it can draw the waveform to the right of the trigger point.

Trigger Modes

The oscilloscope provides four trigger modes: Edge, Pulse , Alternative and Video.
Edge: An edge trigger occurs when the trigger input passes through a specified voltage level in the specified slope direction.
Pulse: Use this trigger type to catch pulses with certain pulse width.
Alternative: Trigger on non-synchronized signals.
Video: Trigger on video-synchronized signals.

Edge Trigger Setting

An edge trigger determines whether the oscilloscope finds the trigger point on the rising or the falling edge of a signal. Select Edge trigger mode to trigger on rising edge, falling edge .

Press TRIG → F1 → Edge button to show the edge trigger menu as the following table.
The Edge trigger menu (Page 1/2)

The Edge trigger menu(Page 2/2)

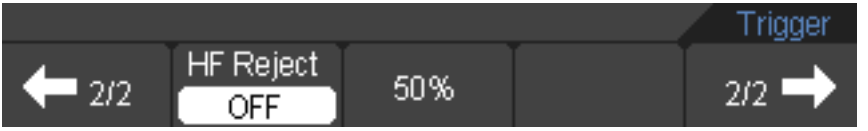


Figure 2-26 The Edge trigger menu

The Edge Trigger Table

Menu	Setting	Description
Source	CH1 CH2	Define CH1 or CH2 as trigger signal
Slope	Rising Falling	Trigger on rising edge or falling edge
Sweep	Auto Normal Single	Acquire waveform even no trigger occurred Acquire waveform when trigger occurred When trigger occurs, acquire one waveform then stop
HF Reject	ON/OFF	Reject high frequency signals

50%		Set the trigger level to the center of the signal

Pulse Trigger Setting

Pulse trigger occurs according to the width of pulse. The abnormal signals can be detected through setting up the pulse width condition.

Press TRIG → F1 → Pulse button to show the pulse trigger menu as the following table.

The Pulse Trigger menu (Page 1/2)

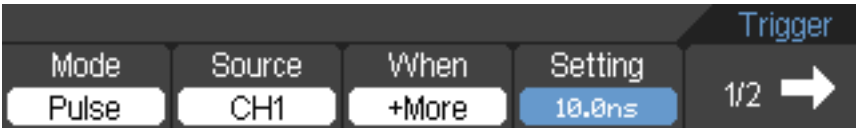


Figure 2-27 The Pulse Trigger Menu

The Pulse Trigger menu (Page 2/2)

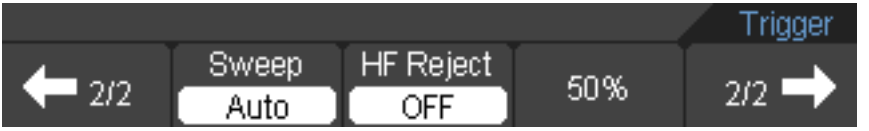


Figure 2-28 The Pulse Trigger Menu

The Pulse Trigger Table (Page 1/2)

Menu	Setting	Description
Source	CH1 CH2	Define CH1 or CH2 as trigger signal
When	+More +Less +Equal -More -Less -Equal	+Pulse width more than selecting pulse condition +Pulse width less than selecting pulse condtion +Pulse width equal to selecting pulse condition -Pulse width more than selecting pulse condition -Pulse width less than selecting pulse condition -Pulse width equal to selecting pulse condition
Setting	Value	Set required pulse width
1/2 ⇨		Go to the next menu page

The Pulse Trigger Table (Page 2/2)

Menu	Setting	Description
2/2 ⇦		Back to the previous menu page
Sweep	Auto Normal Single	Acquire waveform even no trigger occurred Acquire waveform when trigger occurred When trigger occurs, acquire one waveform and then stop
HF Reject	ON OFF	Reject high frequency signals
50%		Set the trigger level to the center of the signal
2/2 ⇨		Back to the previous menu page

Note: The Pulse width adjust range is10ns ~ 10s. When the condition is met, it will trigger and acquire the waveform.

ALT (Alternative) Trigger Setting

When alternative trigger is on, the trigger sources come from two vertical channels. This mode can be used to observe two non-related signals. You can choose two different trigger modes for the two vertical channels. The options are as follows: Edge, Pulse. The info of the trigger level of the two channels will be displayed on the upper-right of the screen.
See the ALT screen in figure 2-29.

Press TRIG → F1 → ALT button to show the ALT trigger menu as the following table.
The ALT Trigger menu (Type Edge)(Page 1/2)

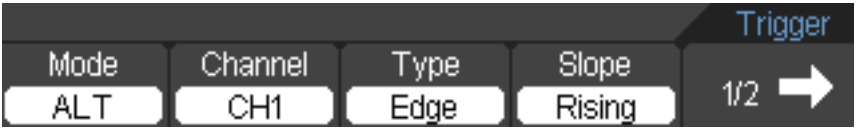


Figure 2-30 The ALT trigger menu

The ALT menu table (Type Edge)(Page 2/2)

Menu	Setting	Description
Channel	CH1 CH2	Set trigger for CH1 Set trigger for CH2

Type	Edge Pulse	Set Edge/Pulse Trigger as the trigger type
Slope	Rising Falling	Trigger on rising edge Trigger on falling edge
1/2 ⇨		Go to the next menu page

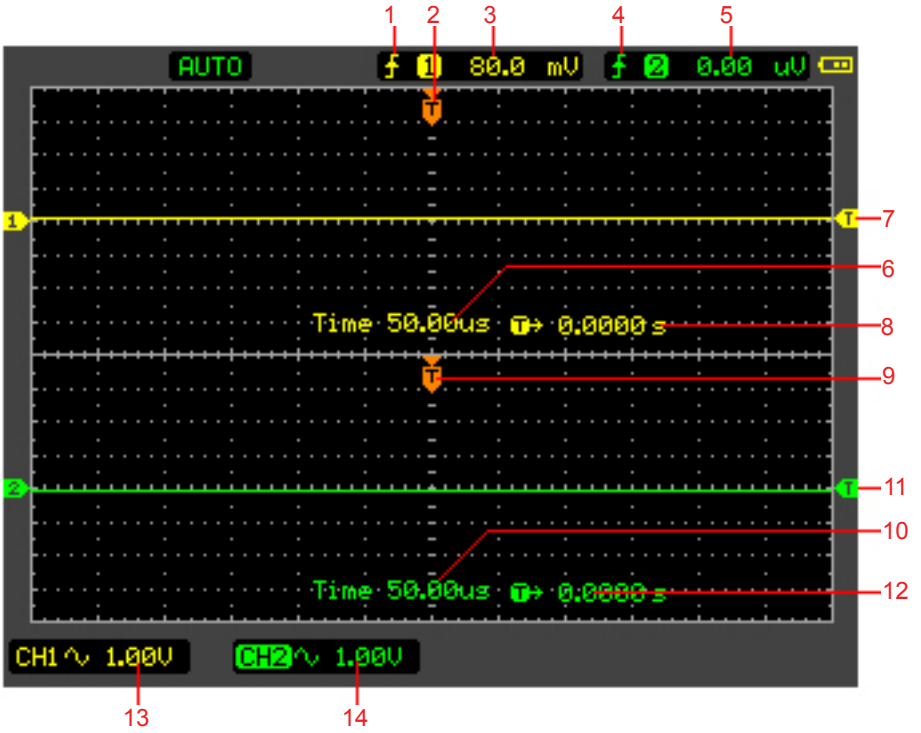


Figure 2-29 ALT Mode Screen

Description:
1. The trigger type of CH1
2. The horizontal trigger position of CH1
3. The trigger level value of CH1
4. The trigger type of CH2
5. The trigger level value of CH2
6. The time base of CH1
7. The trigger level of CH1
8. The trigger delay time of CH1
9. The horizontal trigger position of CH2
10. The time base of CH2

11. The trigger level of CH2
12. The trigger delay time of CH2
13.The CH1 Voltage/Div
14.The CH2 Voltage/Div

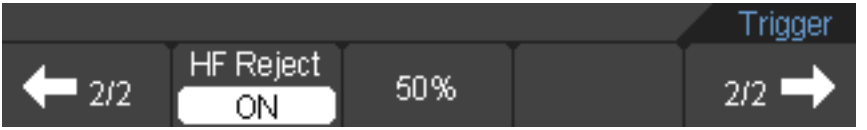


Figure 2-31 The ALT Trigger menu

The Alternative menu table (Type edge)(Page 2/2)

Menu	Setting	Description
2/2 ⇦		Back to the previous menu page
HF Reject	ON OFF	Reject high frequency signals or not
50%		Set the trigger level to the center of the signal
2/2 ⇨		Back to the previous menu page

The ALT Trigger menu (Type Pulse)(Page 1/2)

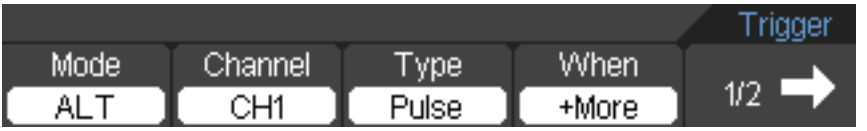


Figure 2-32 The ALT Tirgger menu

The Alternative menu table (Trigger Type: Pulse Page 1/2)

Menu	Setting	Description
Channel	CH1 CH2	Set trigger mode for CH1 Set trigger mode for CH2
Type	Edge Pulse	Set Edge/Pulse Trigger as the trigger type

When	+More +Less +Equal -More -Less -Equal	+Pulse width more than selecting pulse condition +Pulse width less than selecting pulse condition +Pulse width equal to selecting pulse condition -Pulse width more than selecting pulse condition -Pulse width less than selecting pluse condition -Pulse width equal to selecting pulse condition
1/2 ⇨		Go to the next menu page

The ALT Trigger menu (Type Pulse)(Page 2/2)

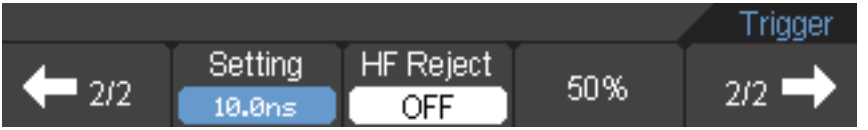


Figure 2-33 The ALT Trigger menu

The Alternative menu table (Trigger Type: Pulse Page 2/2)

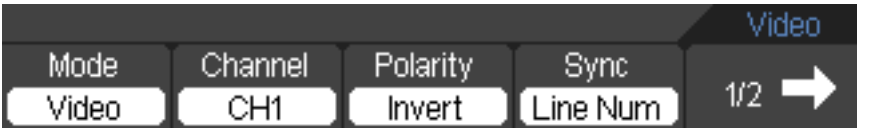
Menu	Setting	Description
2/2 ⇦		Back to the previous menu page
Setting	Value	Set the width of the pulse
HF Reject	ON OFF	Reject high frequency signals or not
50%		Set the trigger level to the center of the signal
2/2 ⇨		Back to the previous menu page

Video Trigger Setting

The Video trigger mode is designed to captrue the video signal type to display stable NTSC or PAL/SECAM standard composite video waveforms.

Press TRIG → F1 → Video button to show the Video trigger menu as the following table.

The Video Trigger menu (Page 1/2)



The Video Trigger menu (Page 2/2)

Figure 2-34 The Video Tirgger menu

The Video Trigger menu table

Menu	Setting	Description
Channel	CH1 CH2	Set trigger mode for CH1 Set trigger mode for CH2
Polarity	Normal Invert	Applicable to the video signal of which the black level is low Applicable to the video signal of which the black level is high
Sync	All Field Odd Field Even Field Line Num All Lines	Set trigger on the falling edge of the first serration pulse to field Set trigger on the falling edge of the first serration pulse to odd field Set trigger on the falling edge of the first serration pulse to even field Set trigger on the selected line in even field or odd field Set trigger on the first line found
1/2 ⇨		Go to the next menu page
2/2 ⇦		Back to the previous menu page
Line Num		Set the lines of trigger video
Standard	PAL/SEC NTSC	Set video standard to PAL/SEC Set video standard to NTSC

Sweep	Auto Normal Single	Force the oscilloscope to trigger in the absence condi-ton Let oscilloscope to trigger in the suitable trigger condi-ton Let oscllloscope to trigger one time in the suitable trig-ger condition,then stop
2/2 ⇨		Back to the previous menu page

Term interpretation

■ **Auto:**
This sweep mode allows the oscilloscope to acquire waveforms even when it does not detect a trigger condition. If no trigger condition occurs while the oscilloscope is waiting for a specific period (as determined by the time-base setting), it will force itself to trigger.
When forcing invalid triggers, the oscilloscope cannot synchronize the waveform, and the waveform seems to roll across the display. If valid triggers occur, the display becomes stable on the screen. Any factor results in the un-stability of waveforms can be detected by Auto Trigger, such as the output of Power supply.

NOTE: When horizontal control is set more than 50 ms/div, Auto mode allows the oscilloscope to capture without trigger signal.

■ **Normal:**
The Normal mode allows the oscilloscope to acquire a waveform only when it is triggered. If no trigger occurs, the oscilloscope keeps waiting, and the previous waveform, if any, will remain on the display.

■ **Single:**
In Single mode, after pressing the RUN/STOP key, the oscilloscope waits for trigger. While the trigger occurs, the oscilloscope acquires one waveform then stop.

Save / Recall Waveforms and Setups

Press the Save/Recall button, the interface menu for settings shows as follows.
The Save/Recall Menu Table

Menu	Setting	Description
Type	Wave Setup Bitmap CSV Factory	Store or recall waveform Store or recall instrument setups Create or delete bitmap files Create or delete CSV files Recall factory setups
Internal		Go to menu for internal memory operation

External		Go to menu for external memory operation

Wave

The Wave menu

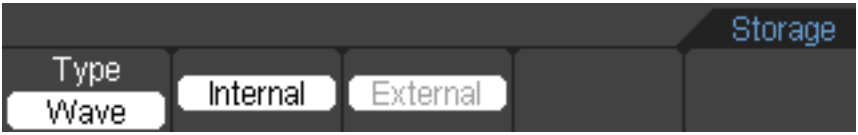


Figure 2-35 The Wave menu

The Wave menu table

Menu	Setting	Description
Internal		Go to menu for internal memory operation
External		Go to menu for external memory operation

Setup

The Setup menu

Figure 2-36 The Setup menu

The Setup menu table

Menu	Setting	Description
Internal		Go to menu for internal memory operation
External		Go to menu for external memory operation

Bitmap

The Bitmap menu

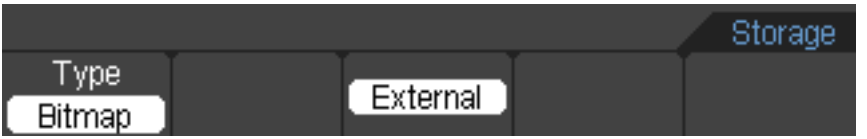


Figure 2-37 The Bitmap menu

The Bitmap menu table

Menu	Setting	Description
External		Go to menu for external memory operation

CSV

The CSV menu

Figure 2-38 The CSV menu

The CSV menu table

Menu	Setting	Description
External		Go to menu for external memory operation

Factory

The Factory menu

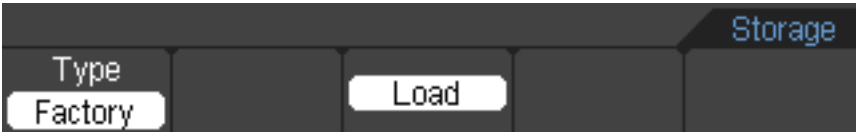


Figure 2-39 The Factory menu

The Factory menu table

Menu	Setting	Description

Load		Recall factory setups or files

Internal Memory

Press **SAVE/RECALL →Internal** to go to the following menu

Menu	Setting	Description
Internal	Setup_01 ... Setup_15	Set up the location of files in internal memory
Load		Recall waveform files and setup files from the internal memory location
Save		Save waveform files and setup files to the internal memory location

External Memory

Press **SAVE/RECALL → External** to go to the following menu.

Menu	Setting	Description
New File		To create new file
Delete File		Delete file
Load		Recall waveform and setup from USB storage device

File system as following:

Figure 2-40 File System

Factory
The oscilloscope has default settings and can be recalled at any time.

Memory location
Specify the memory location to save/recall the waveforms and setups.

Load
Recall saved waveforms, setups and default settings.

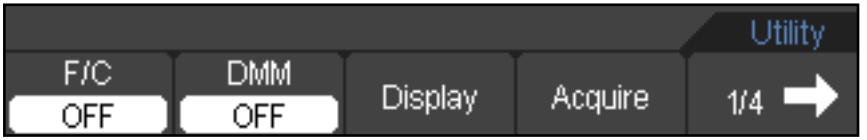
Save
Save waveforms and setups.

Note:
1. Select save stores not only the waveforms, but also the current oscilloscope.
2. The oscilloscope can store 15 settings permanently and can restore at any time.

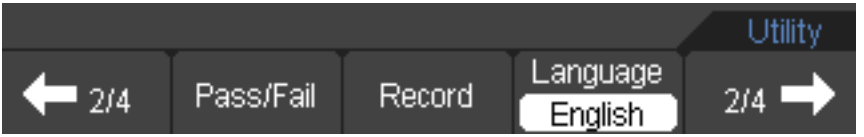
Utility Function

Press the Utility button to show the menu of the settings in the Utility system.

The series without RS232 and LAN:
The Utility menu (Page 1/4)



The Utility menu (Page 2/4)



The Utility menu (Page 3/4)

The Utility menu (Page 4/4)

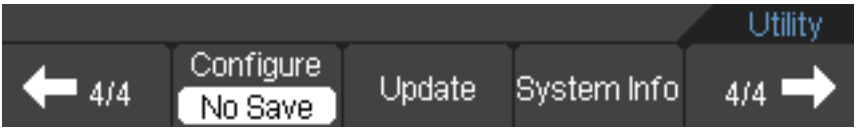
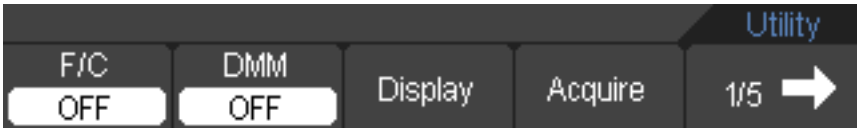
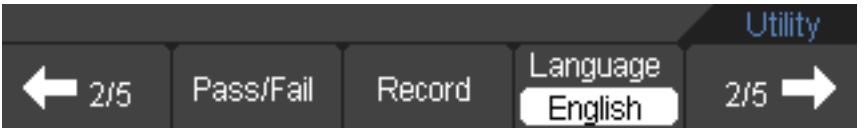


Figure 2-41 The Utility menu(without RS232 and LAN)

The series with RS232 and LAN:
The Utility menu (Page 1/5)

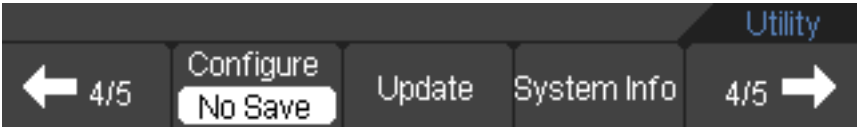


The Utility menu (Page 2/5)



The Utility menu (Page 3/5)

The Utility menu (Page 4/5)



The Utility menu (Page 5/5)

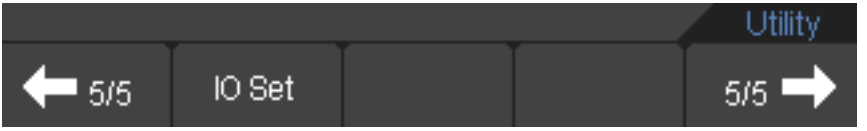


Figure 2-42 The Utility menu (with RS232 and LAN)

The Utility menu table (Page 1/4 and Page 1/5)

Menu	Setting	Description
F/C	OFF	Turn off Frequency or Counter
	Frequency	Turn on Frequency
	Counter	Turn on Counter
DMM	ON OFF	Turn on the multimeter Turn off the multimeter
Display		Show Display menu page
Acquire		Go to the Acquire menu page
1/4 ⇨		Go to the next menu page

1/5 ⇨		Go to the next menu page

The Utility menu table (Page 2/4 and Page 2/5)

Menu	Setting	Description
2/4 ⇦		Back to the previous menu page
2/5 ⇦		Back to the previous menu page
Pass/Fail		Go to Pass/Fail menu page
Record		Go to Record menu page
Language		Select languages (More languages may be added in later firmware versions.)
2/4 ⇨		Go to the next menu page
2/5 ⇨		Go to the next menu page

The Utility menu table (Page 3/4 and Page 3/5)

Menu	Setting	Description
3/4 ⇦		Back to the previous menu page
3/5 ⇦		Back to the previous menu page
Shut Down	5Min 10Min 20Min 30Min Infinite	Set the shut down time
Sound	ON OFF	Turn beeper sound on/off
Calibrate		Calibrate the oscilloscope
3/4 ⇨		Go to the next menu page

3/5 ⇨		Go to the next menu page

The Utility menu table (Page 4/4 and Page 4/5)

Menu	Setting	Description
4/4 ⇦		Back to the previous menu page
4/5 ⇦		Back to the previous menu page
Configure	No Save Save	Not save the system configuration when shut down Save the system configuration when shut down
Update		Update the system
System Info		Show the information of the system
4/4 ⇨		Go to the first previou menu page
4/5 ⇨		Go to the next menu page

The Utility menu table (Page 5/5)

Menu	Setting	Description
5/5 ⇦		Back to the previous menu page
IO Set		Go to the IO Set menu Page
5/5 ⇨		Go the the first previous menu page

Calibrate

The calibration adjusts the internal circuitry to get the best accuracy. Use these functions to calibrate the vertical and horizontal systems.
For maximum accuracy at any time, run this calibration if the ambient temperature changes by 5°C or more.

Before running this procedure, do these steps:
1. Disconnect any probes or cables from all channel inputs, otherwise failure or damage to the oscilloscope may be occurred.
2. Push the Utility button and select Calibrate.

The calibration screen is shown as in Figure 2-43.

Figure 2-43 The Calibration Screen

Note:
The oscilloscope must have been working or warm-up at least 30-minutes before running calibration to get best accuracy.
The oscilloscope will calibrate parameter of vertical system (CH1, CH2).

Pass/Fail

The Pass/Fail function monitors changes of signals and output pass or fail signals by comparing the input signal is within the pre-defined mask.

Press Utility→Pass/Fail to go to the following menu.
The Pass/Fail menu (Page 1/2)

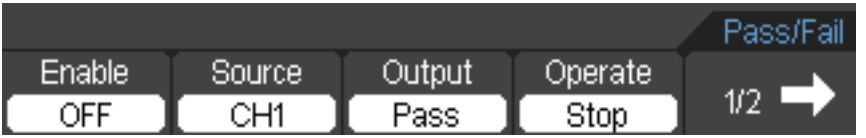


Figure 2-44 The Pass/Fail menu

The Pass/Fail menu (Page 2/2)

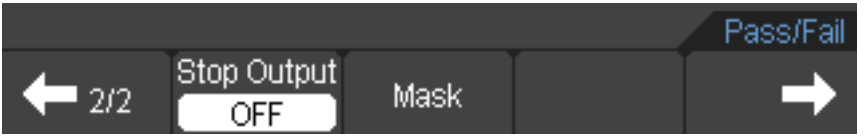


Figure 2-45 The Pass/Fail menu

The Pass/Fail menu table (Page 1/2)

Menu	Setting	Description
Enable	ON OFF	Turn on Pass/Fail test Turn off Pass/Fail test
Source	CH1 CH2	Select Pass/Fail test on CH1 Select Pass/Fail test on CH2
Output	Fail Pass Fail+Beep Pass +Beep	Output when Fail condition detected Output when Pass condition detected Output and Beep when Fail condition detected Output and Beep when Pass condition detected
Operate	Stop Start	Pass/Fail test stopped, press to run Pass/Fail test running, press to stop
1/2 ⇨		Go to the next menu page

The Pass/Fail menu table (Page 2/2)

Menu	Setting	Description
2/2 ⇦		Back to the previous menu page
Stop output	ON OFF	Stop test when output occur Continue test when output occur
Mask		Go to Mask menu
2/2 ⇨		Back to the previous menu page

Mask setting

Press Utility→Pass/Fail→Mask Setting to go to the following menu.
The Mask menu (Page 1/2)

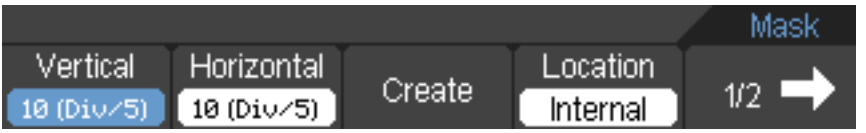


Figure 2-46 The Mask menu

The Mask menu (Page 2/2)

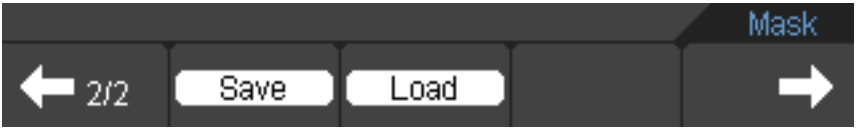


Figure 2-47 The Mask menu

The Mask setting menu table (Page 1/2)

Menu	Setting	Description
Vertical		Set vertical clearance to the waveform
Horizontal		Set horizontal clearance to the waveform
Create		Create a test mask according to the above clearance
Location	Internal External	Store created test mask into internal/External memory
1/2 ⇨		Go to the next menu page

The Mask setting menu table (Page 2/2) When the save as internal memory

Menu	Setting	Description
2/2 ⇦		Back to the previous menu page
Save		Store created test mask into internal memory
Load		Recall mask setting file from internal memory
⇨		Back to the previous menu page

The Mask setting menu (Page 2/2) When the save as external memory

Menu	Setting	Description
Save		Go to save menu (same as REF save menu)
Load		Recall mask setting file from external memory

Waveform Recorder

Waveform recorder records input waveforms from CH1 and CH2, with a maximum record length of 1000 frames.

Press Utility→Record Setting to go to the following

Waveform recorder: Record the waveforms with specified interval.
The Recorder menu (Record Mode) (Page 1/2)

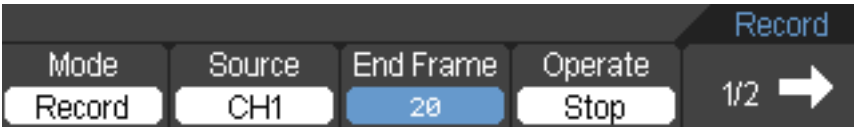


Figure 2-48 The Recorder menu (Record Mode)

The Recorder menu (Record Mode) (Page 2/2)

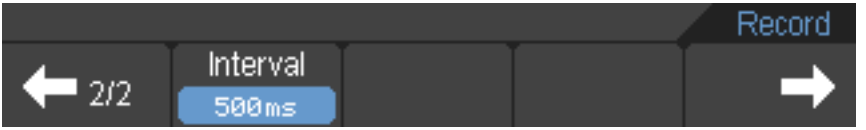


Figure 2-49 The Recorder menu (Record Mode)

The Record menu table (Record Mode) (Page 1/2)

Menu	Setting	Description
Mode	Record Play Storage OFF	Select record mode Select play mode Select storage mode Turn off all recorder function
Source	CH1 CH2	Select record source channel
End Frame	<1-1000>	Set number of record frames
Operate	Start Stop	Record stopped, press to start recording Press to stop recording

1/2 ⇨		Go to the next menu page

The Record menu table (Record Mode) (Page 2/2)

Menu	Setting	Description
2/2 ⇦		Back to the previous menu page
Interval	<10.0ms-20s>	Set time interval between record frames
⇨		Back to the Utility menu page

Play : Play back the recorded waveforms.

The Record menu (Play Mode) (Page 1/2)

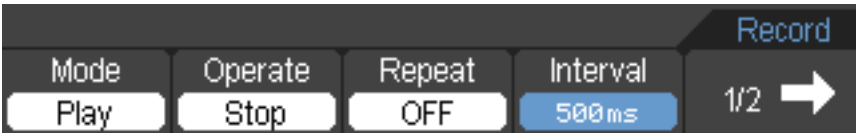


Figure 2-50 The Record menu (Play Mode)

The Record menu (Play Mode) (Page 2/2)

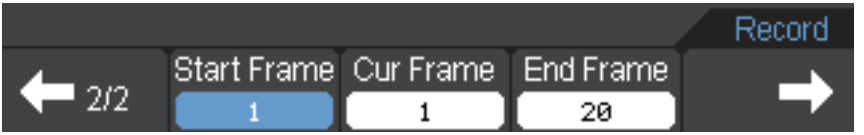


Figure 2-51 The Record menu (Play Mode)

The Record menu table (Play Mode) (Page 1/2)

Menu	Setting	Description
Operate	Start Stop	Play stopped, press to start playback Press to stop playing
Repeat	ON OFF	Set repeat play mode or not
Interval	<10.0ms-20s>	Set interval time to play back

1/2 ⇨		Go to the next menu page

The Record menu table (Play Mode) (Page 2/2)

Menu	Setting	Description
2/2 ⇦		Back to the previous menu page
Start Frame	<1-1000>	Set start frame
Cur Frame	<1-1000>	Select current frame to be played
End Frame	<1-1000>	Set End frame
⇨		Back to the previous menu page

Storage: Store recorded waveforms to non-volatile memory according to the setup frames.

The Record menu (Storage Mode) (Page 1/2)

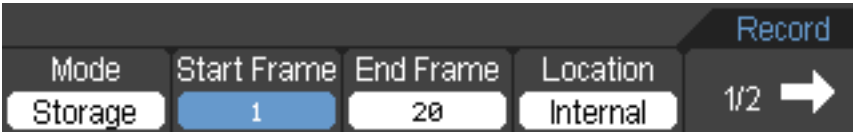


Figure 2-52 The Record menu (Storage Mode)

The Record menu (Storage Mode) (Page 2/2)

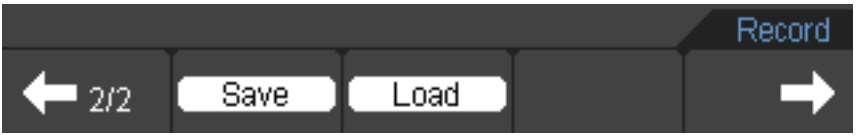


Figure 2-53 The Record menu (Storage Mode)

The Record menu (Storage Mode) (Page 1/2)

Menu	Setting	Description
Start Frame	<1-1000>	Set first frame to be saved

End Frame	<1-1000>	Set end frame to be saved
Location	Internal External	Set up Store location
1/2 ⇨		Go to the next menu page

The Record menu when the save to Internal memory (Storage Mode) (Page 2/2)

Menu	Setting	Description
Save		Save recorded waveform to internal memory location
Load		Recall recorded waveform from internal memory location
⇨		Back to the Utility menu page

The Record menu when the save as external memory (Storage Mode) (Page 2/2)

Menu	Setting	Description
Create File		Create a new file
Delete File		Delete a selected file
Load		Recall recorded waveform from external memory location

Language:

DSO1000 series oscilloscopes have multi-language user menu, choose as your desire.

Press Utility→Language to select the language.

Signal Measurement

Press the MEAS button to display the menu of the automatic measurements settings.

The Measure menu (Page 1/5)

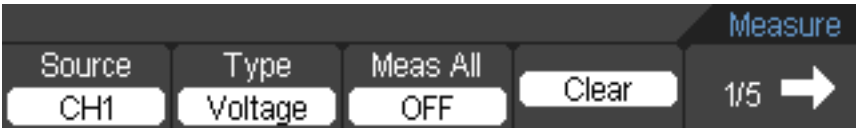


Figure 2-54 The Measure menu

The Measure menu (Page 2/5)

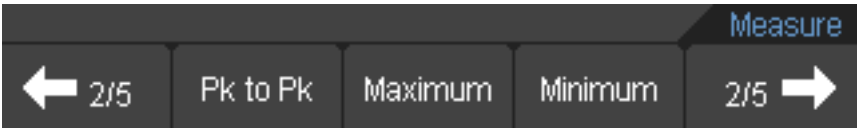


Figure 2-55 The Measure menu

The Measure menu (Page 3/5)

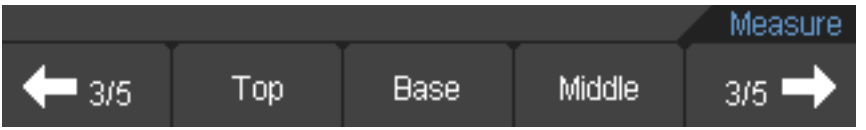


Figure 2-56 The Measure menu

The Measure menu (Page 4/5)

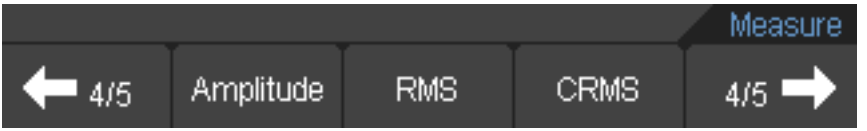


Figure 2-57 The Measure menu

The Measure menu (Page 5/5)

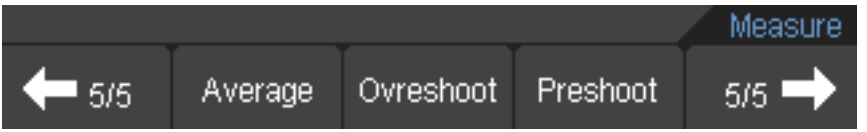


Figure 2-58 The Measue menu

The oscilloscope provides 22auto measurements:Vpp,Vmax,Vmin,Vtop,Vmid,Vbase,Vamp, Vavg, Vrms,Vcrms, Overshoot, Preshoot, Freq, Period, Rise Time, Fall Time, +Width, -Width, +Duty, -Duty, Delay1->2↑, Delay1->2↓ (12 voltage and 10 time measurements).

The Measure menu table

Menu	Setting	Description

Source	CH1 CH2	Select CH1 or CH2 as source channel for measurement
Type	Voltage Time	Select to measure voltage parameter
Meas All	ON OFF	Turn on all measurement result Turn off all measurement result
Clear		Clear measurement result on screen
1/2 ⇨		Go to the next menu page

The Voltage Measurement menu table

Menu	Description
Pk to Pk	Peak-to-peak = Max - Min Measured over the entire waveform
Maximum	Voltage of the absolute maximum level Measured over the entire waveform
Minimum	Voltage of the absolute minimum level Measured over the entire waveform
Top	Voltage of the statistical maximum level Measured over the entire waveform
Base	Voltage of the statistical minimum level Measured over the entire waveform
Amplitude	Amp = Base - Top Measured over the entire waveform
RMS	The Root Mean Square voltage over the entire waveform
Preshoot	Positive Overshoot = (Max - Top)/Amp x 100 % Measured over the entire waveform
Overshoot	Negative Overshoot = (Base - Min)/Amp x 100 % Measured over the entire waveform
Middle	Voltage of the 50% level from base to top
Average	Average voltage of a waveform
CRMS	The Root Mean Square voltage over the first cycle in the waveform

The Time Measurement menu table

Menu	Description

Frequency	Reciprocal of the period of the first cycle in the waveform
Period	Time to take for the first signal cycle to complete in the waveform
Rising	The time taken from lower threshold to upper threshold
Falling	The time taken from upper threshold to lower threshold
+Width	Measured of the first positive pulse in the waveform
-Width	Measured of the first negative pulse in the waveform
+Duty	Positive Duty Cycle = (Positive Pulse Width)/Period x 100% Measured of the first cycle in waveform
-Duty	Negative Duty Cycle = (Negative Pulse Width)/Period x 100% Measured of the first cycle in waveform
Delay1->2↑	The delay of rising time between CH1 and CH2
Delay1->2↓	The delay of falling time between CH1 and CH2

Note: The results of the automatic measurements will be displayed on the bottom of the screen. Maximum 3 results could be displayed at the same time. When there is no room, the next new measurement result will make the previous results moving left out of screen.

Cursor Measurement

The screen displays two parallel cursors. Move the cursors to make custom voltage or time measurements of the signal. The values are displayed on the boxes below the menu. Before using cursors, make sure to set the Signal Source as the channel for measuring.
Press **CURSOR** to show the cursor menu as the following:

The Cursor menu

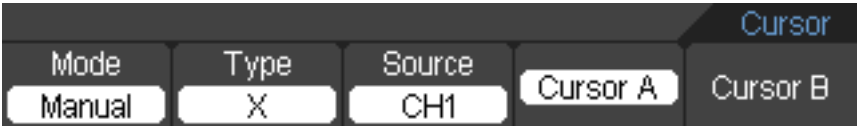


Figure 2-59 The Cursor menu

The Cursors menu table

Menu	Setting	Description

Mode	Manual Track Auto OFF	Set to Manual Mode Set to Track Mode Set to Auto Mode Turn off the cursor measure
Type	X Y	Shown as vertical line to measure the horizontal parameters Shown as horizontal line to measure the vertical parameters
Source	CH1 CH2 MATH	Select the measurement signal source
Cursor A		Select Cursor A or not
Cursor B		Select Cursor B or not

The oscilloscope measures the Y or X coordinate values of the cursors, and the increments between the two cursors.

To do cursor measurements, please do as the following steps:
1. Turn on the cursor measurement:
   Cursor→Mode→Manual / Track / Auto.
2. Select channel Source for measurements by pressing soft button as:
   Cursor→Source→CH1 / CH2 / MATH.
3. Select the cursors type by pressing soft button as Cursor→Type→ X or Y.
4. Press F4 or F5 to select the Cursor A or Cursor B.
5. Move the cursors to adjust the increment between the cursors.

The values will be automatically displayed on the right upper corner of screen when the cursor function menu is hidden or displaying other menus.

Comments of Cursor Measurements

1. Auto Cursor Mode
The Auto Cursor Mode displays the cursors for the current measuring automatically. See figure 2-60.

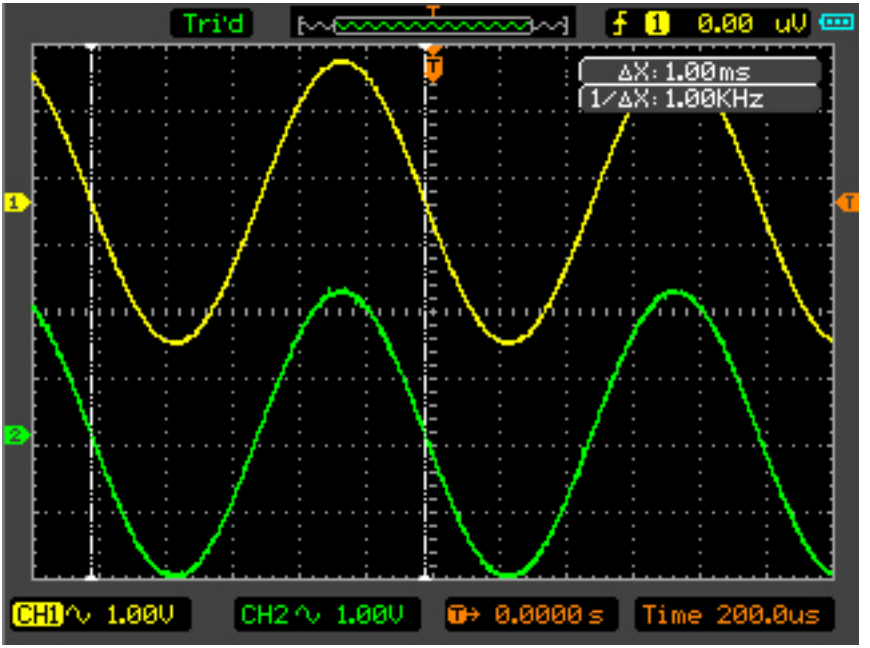


Figure 2-60 The Automatic Cursor Mode

2. Manual Cursor Mode

In this mode, the oscilloscope measures the Y or X coordinate increments between the two cursors. See figure 2-61.

1) Select menu Mode->Manual.
2) Select menu Type->X/Y to get the vertical or horizontal of Cursor A or Cursor B.
3) Select menu Source->CH1/CH2/MATH to Get the Cursor Source.
4)Select Cursor A or Cursor B to adjust the increments between Cursor A and Cursor B.
5) Get the values between Cursor A and Cursor B.
delt x is the time between Cursor A and Cursor B.
1/(delt x) is the frequency between Cursor A and Cursor B.

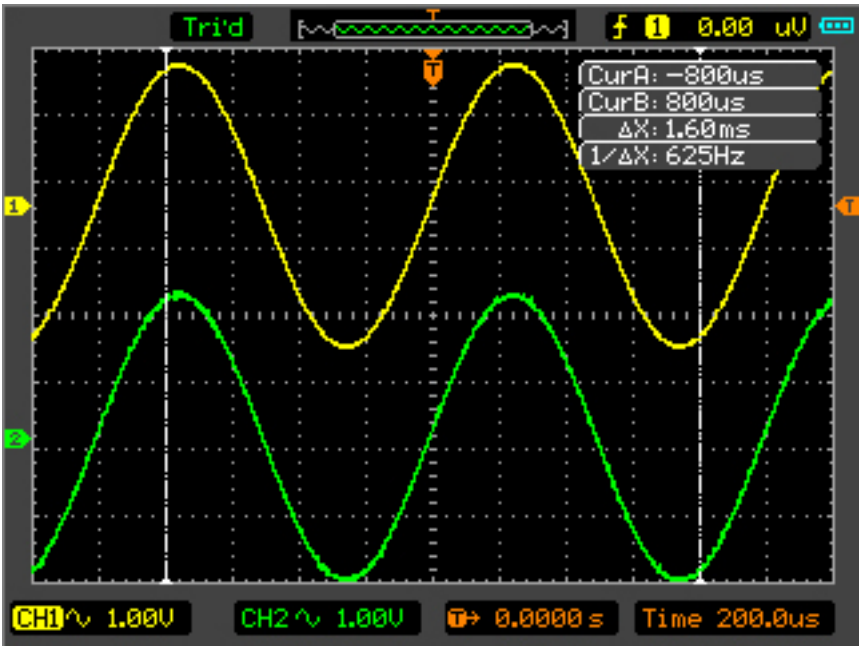


Figure 2-61 The Manual Cursor Mode

3. Track Cursor Mode

In Track Cursor Mode, the Cursor A and Cursor B move together with the selected waveform. See figure 2-62.

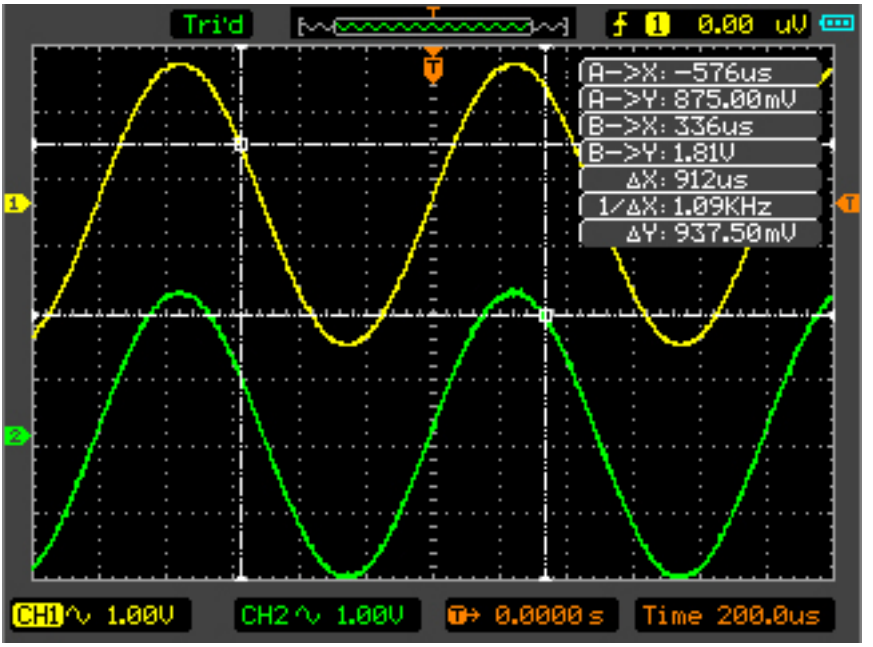


Figure 2-62 Track Cursor Mode

Please do the following steps:

1. Select menu Mode->Track.
2. Select Source for measurements. Select options as followings.
   Cursor A->CH1/CH2. Cursor B->CH1/CH2.
3. Select Cursor A or Cursor B. Move the Select Cursors to adjust the increments between the Cursors.
4. Get the values between Cursor A and Cursor B.
   delt x is the time between Cursor A and Cursor B.1/(delt x) is the frequency between Cursor A and Cursor B.delt y is the voltage between the Cursor A and Cursor B.

IO Set

Press UTILITY→ F5 → F5→ F5 → F5→ F2 button to show the menu of IO Set
The IO Set menu (LAN)

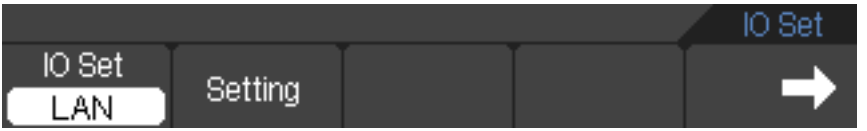


Figure 2-63 The IO Set menu(LAN)

The IO Set menu table(LAN)

Menu	Setting	Description
Setting		Create a new LAN connection
⇨		Go to the Utility menu page

The IO Set menu(RS232)

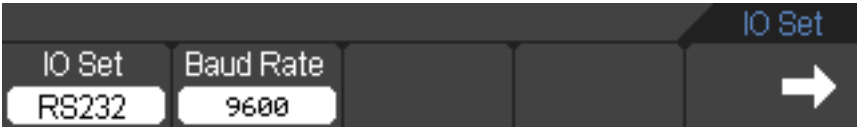


Figure 2-64 The IO Set menu(RS232)

The IO Set menu table(RS232)

Menu	Setting	Description
Baud Rate	300 600 1200 2400 4800 9600	Set Baud Rate parameter for RS232
⇨		Go to the Utility menu page

Press the button F2 in the IO Set menu(LAN) ,then a small window pops up.
You can select the Arrow keys to move the cursor position in which you want to modify parameter, then press the Enter key to pop up a soft key board by which you can set what you want .

See the LAN setting window in Figure 2-65.

Figure 2-65 the Lan Setting window

Press the button F2 in the IO Set menu(RS232),you can modify Baud Rate value.

See the IO Set menu (RS232) in Figure 2-64.

Acquire

When you acquire an analog signal, the oscilloscope will convert it into a digital one. There are two kinds of acquisition: Real-time acquisition and Equivalent acquisition. The real-time acquisition has three modes: Sample, Peak Detect, and Average. The acquisition rate is affected by the setting of time base.

Press UTILITY→ F4 button to show the menu of Qcquire.

Peak:the oscilloscope gets the maximum and minimum values of the input signal over each sample interval and uses these values to display the waveform.
Sinx/x: The Sinx/x can be used in time base range of 50ns~5ns.

Chapter 3 Using examples

Example 1: Simple Measurement

To acquire and display a signal, please do the steps as followings:
1. Connect signal to CH1 by using probe.
2. Press the key AUTO on key panel.

The Oscilloscopes set the vertical, horizontal, and triggers controls at the best status automatically. Also, you can adjust the controls to meet your measurements to optimize the waveform display.

To measure the frequency and Vpp, you can do these steps as followings:
1. Press the key MEAS , Select Source -> CH1 and select Type ->Voltage, then press the key F5 and then press the key F2 to make a Pk to Pk test. The Vpp value will display on the bottom of the waveform interface.
2. Press the key MEAS, select Source ->CH1and select type->Time, then Press the key F5 and then press the key F2 to make a Frequency test. The Frequency value will display on the bottom of the waveform interface.
3. Click the item Clear in the Measure menu, To clear the measurements on the waveform interface.

See the measurements in the figure 3-1.

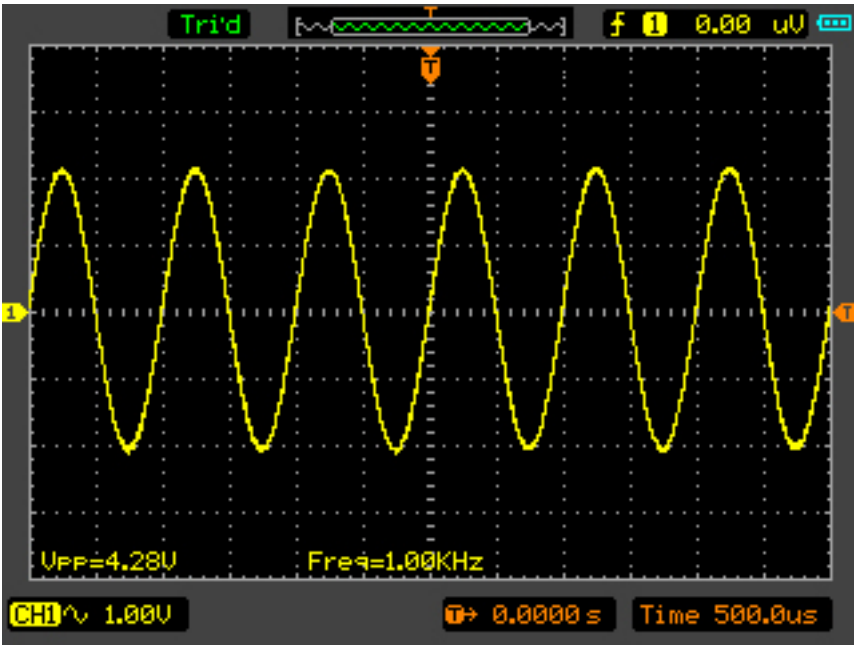


Figure 3-1 The Vpp and Freq measurement Window

Example 2: The Application of the X-Y Operation

X-Y Plot acts to analyze correlation of data of two channels. Lissajous diagram is displayed in the screen when you use X-Y Plot,which enables to compare frequencies,amplitudes and phases of counterpart waveform against the reference waveform. This makes it possible to compare and analyze frequency , amplitude and phase between the input and output.

Do these steps as followings:

1. Set the probe attenuation to "x10".Set the switch to"x10" on the probes.
2. Connect the CH1 probe to the input of the circuit, and connect the CH2 probe to the output of the circuit.
3. Click the key AUTO on the panel.
4. Adjust the vertical scale and offset to display approximately the same amplitude signals on each channel.
5. Select Time Base->X-Y format in Horizontal menu. The oscilloscope will display a Lissajous pattern representing the input and the output characteristics of the circuit.
6. Adjust the scale and offset of the horizontal and vertical to a desirable waveform display. The following picture shows a typical example.
7. Apply the Ellipse Method to observe the phase difference between the two channels.

See Signal in X-Y Format in figure 3-2.

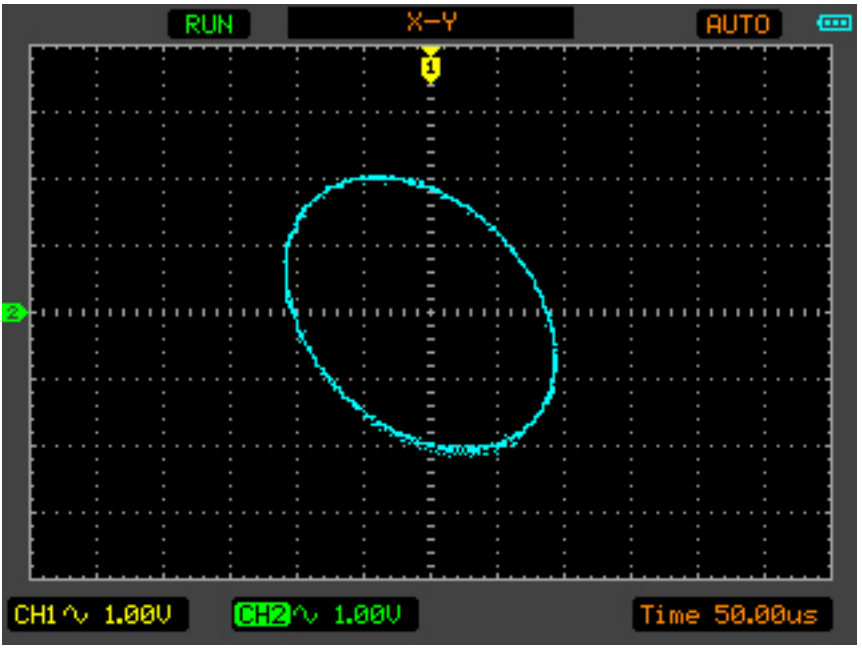
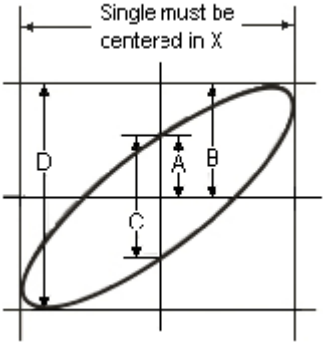


Figure 3-2 Signal in X-Y Format

Instruction of the Ellipse Method



Sinθ = A/B or C/D, where θ = phase shift (in degrees) between the two signals.
From the formula above:

θ = ±arcsine (A/B) or ±arcsine (C/D)

θ must be in the range of (0~π/2) or (3π/2~2π) if the main axis of the ellipse is between I and III quadrant, . If the main axis is at II and IV quadrant, θ must be in the range of (π/2~π) or (π~3π/2).

Example 3: The FFT Cursor Measurements

FFT measurement includes: Amplitude measurement (Vrms or dBVrms) and the Frequency measurement (Hz).
Do these steps as followings:
1. Press the key CURSOR to show Cursor menu.
2.Select Mode->Manual to enter the Manual Cursor Mode window.
3. Select Type->X/Y, select the Cursor Type to X or Y.
3. Select Source->MATH(FFT operation) in the Manual Cursor Mode window.
4. Drag the Cursor to the point of interest.
See the FFT Measurement (Cursor Type Y) in figure 3-3.

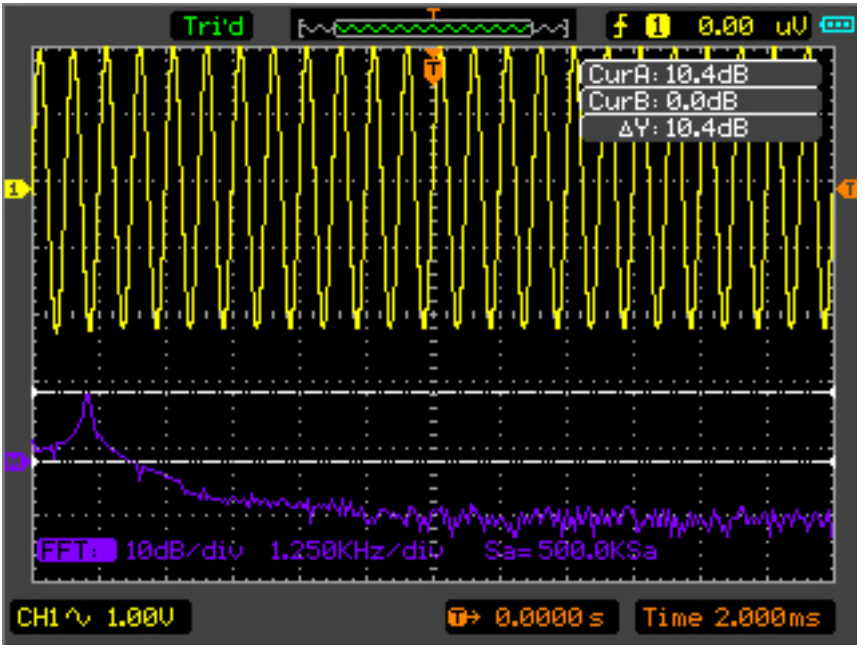


Figure 3-3 FFT Measurement (Cursor Type Y)

See the FFT Measurement (Cursor Type X) in figure 3-4.

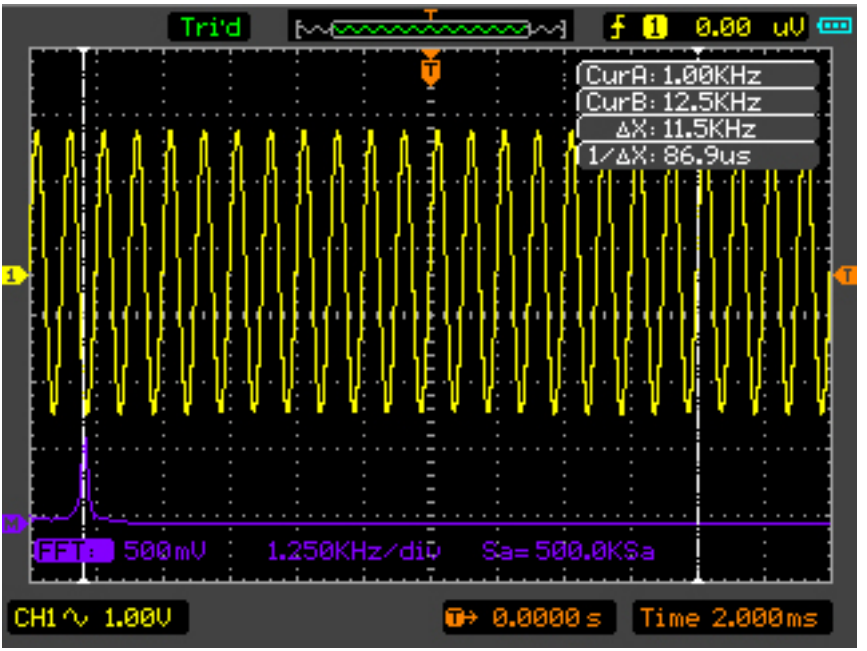


Figure 3-4 FFT Measurement (Cursor Type X)

Example 4: The Pass/Fail Test

The Pass/Fail Test is one of the enhanced special functions of the oscilloscope. By this function, the oscilloscope could compare the input signal with the established waveform mask. If the waveform “touches” the mask, a “Fail” signal occurs. Otherwise the test passes. When needed, a programmable output can be used for external automatic control applications. The output is built in as a standard feature and is optically isolated. Do the steps as followings:

1. Press the key Utility to enter the Utility menu.
2. Press the key F5 in the panel to enter the page 2/4.
3. Select the Pass/Fail in the Utility menu to enter the Pass/Fail menu.
4. Select Enable to ON to turn on Pass/Fail, Select Source CH2 (the input source), select Stop Output to OFF or ON in Page 2/2 of Pass/Fail menu.
5. Create the Pass/Fail Mask: Change the Vertical or Horizontal value by click the up or down key in the panel to set the div of the vertical or horizontal values. Select Create or Save or Load button if you need.
6. Select Operate to Start in Pass/Fail menu to start the Pass/Fail function.

See the Pass/Fail window in figure 3-5.

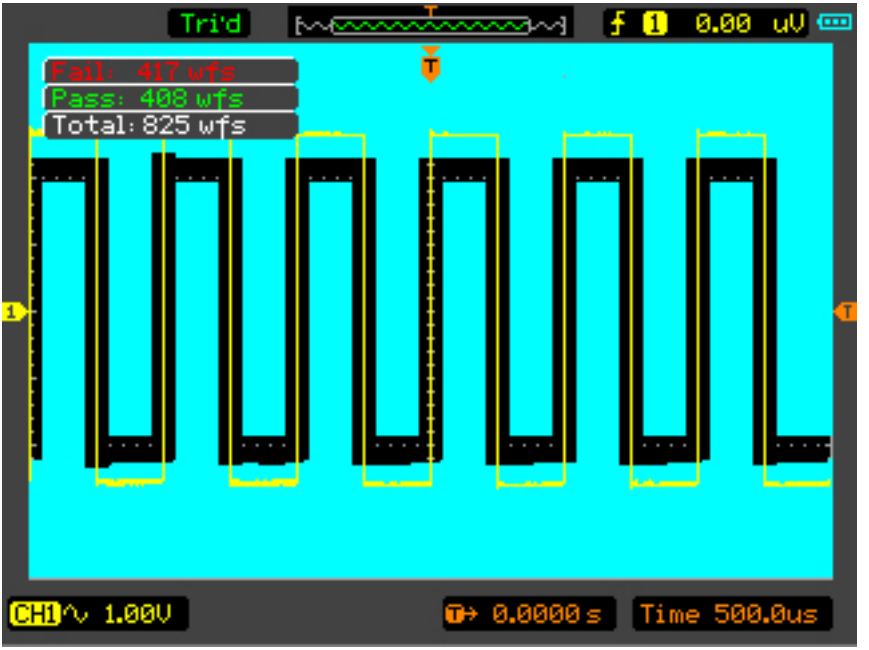


Figure 3-5 The Pass/Fail Window

Example 5: Reduce the noise on a signal

See the signal with random noise in figure 3-6.

To reduce random noise, do the following steps:
1. Set the Probe and the channel attenuations to “x10”.
2. Connect the signal to the oscilloscope to display a stable wave.
3. Reduce the noise Select the Acquire Mode in Acquire menu.

If there is noise within the signal and the waveform looks too wide, in this case, choose average acquisition. In this mode the waveform will be thin and easy to observe and measure.

Use the Average following the steps:
1. Select Acquire in the Utility menu to enter the Acquire menu.
2. Select Mode to Average, then Press F2 to change the Averages form 2 to 128 to switch the number of averages that best eliminates the noise from the displayed waveform.
3. Select Mode to Normal to cancel this function.

See signal after reducing random noise in figure 3-7.

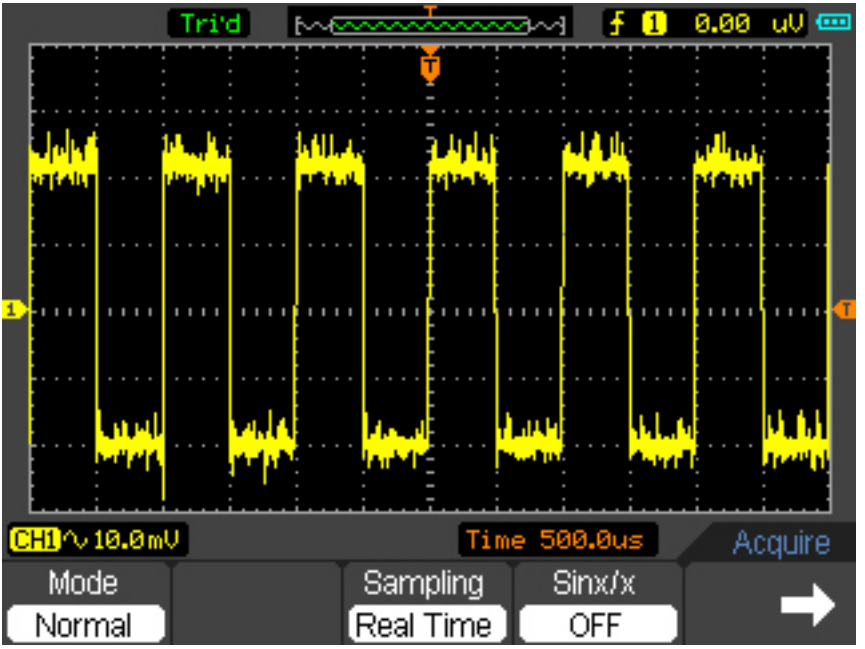


Figure 3-6 Signal with random noise

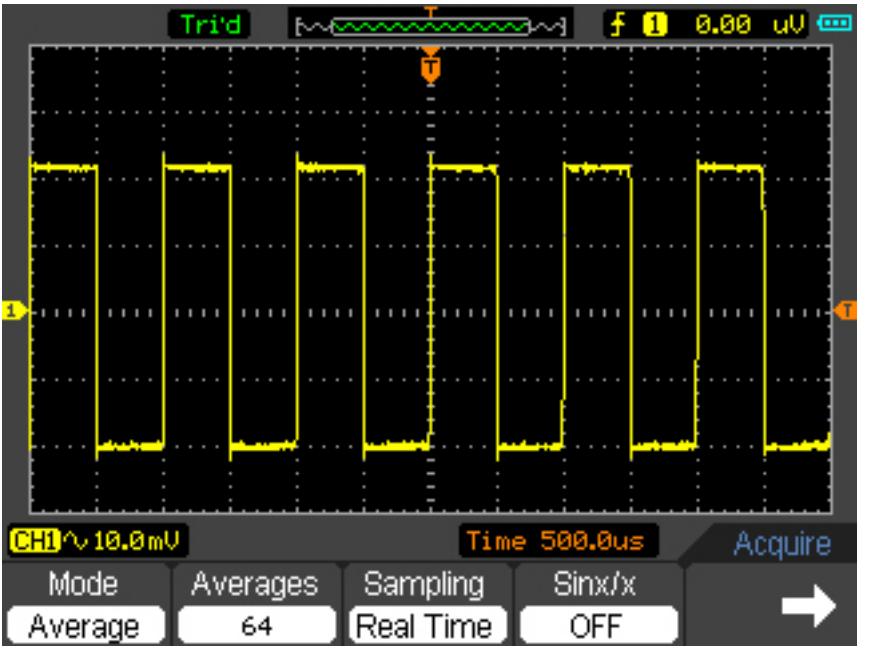


Figure 3-7 Signal afer reducing random noise

Example 6: Capture a Single signal

To capture a single event, it needs to gather some pre-test knowledge of the signal in order to set up the trigger level and slope correctly. For example, if the event is derived from TTL logic, a trigger level of 2 Volts should work on a rising edge.

Do these steps as followings:

1. Set the probe and the channel attenuations to 10X.
2. Press the key TRIG to show the Trigger menu.
3. Select Mode->Edge. Set Source to CH1 and Slope to Rising. Set Sweep to Single.
4. Adjust the Volts/Div and the time base in a proper range for the signal.
5. Drag the trigger level sign on the waveform display screen.
6. When the trigger conditions are met, data appears on the display representing the data points that the oscilloscope obtained with one acquisition.

CHAPTER 4: Multimeter

About this chapter

This chapter provides an introduction to the multimeter functions of DSO1000 Series. The introduction gives guides to show how to use the menus and perform basic measurements.

Connecting the Meter

Use the 4-mm safety banana jack inputs for the Meter functions: 10A , mA, COM,V/Ω/C.

Multimeter Operation Window

Figure 4-1 Multimeter operation window

Description

1) Battery electric quantity indictor.
2) Measurement mode indictors:

DC: Direct electric measurement
AC: Alternating electric measurement
3)The symbol of Mutimeter current mode.
4) Manual/Auto range indictors, among which the MANUAL refers to measuring range in manual operation mode and Auto means the measuring range in automatic operation mode.
5) The reading value of measurement.
6) The bar graph indictor.
7) DC or AC Measurement mode control.
8) Absolute /relative magnitude measuring control: The sign "||" expresses the absolute magnitude measuring control and " △ " represents the relative magnitude measuring control.
9) Manually or automatically measuring range control.

Operating the Multimeter

If you are in the scope mode window, press OSC/DMM key, the oscilloscope will switch to the multimeter mode window.Then the screen will display the measure mode window that was in use the last time before you quit multimeter measure. When you switch to the multimeter measurement the first time, the default measure mode is DC voltage mode.

Measuring Resistance Values

To measure a resistance, do the following:
1) Press the R key and then resistance measurement window appears on the screen.
2) Insert the black lead into the COM banana jack input and the red lead into the V/Ω/C banana jack input.
3) Connect the red and black test leads to the resistor. The resistance value is shown on the screen in Ohm.

Then, the screen will look like the following figure 4-2.

Figure 4-2 Resistance Measurement

Making a Diode Measurement

To make a measurement on the diode, do the following:

1) Press the diode key and a diode symbol appears at the top of the screen.
2) Insert the black lead into the COM banana jack input and the red lead into the V/Ω/C banana jack input.
3) Connect the red and black leads to the diode and the voltage value of the diode is displayed on the screen in volt.

Then, the screen will look like the following figure 4-3.

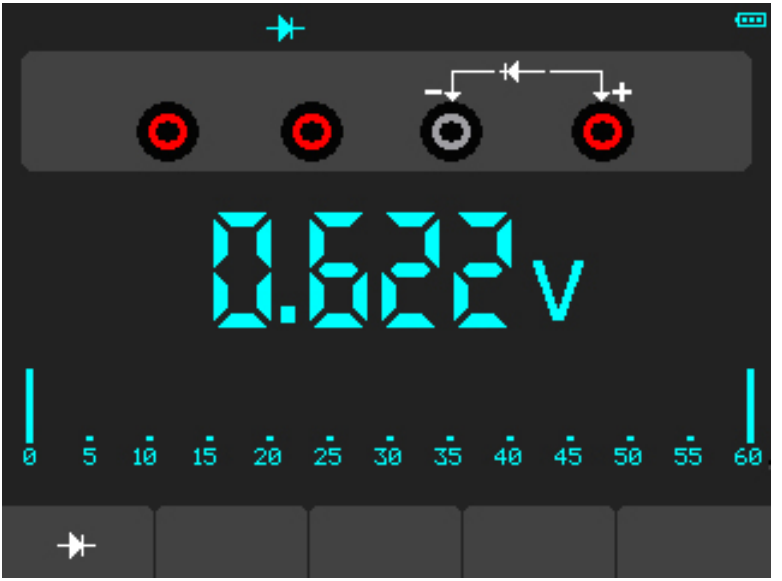


Figure 4-3 Diode Measurement

To perform an On-off test, do the following:

1) Press the On-off key and then On-off indictor appears on the top of the screen.
2) Insert the black lead into the COM banana jack input and the red lead into the V/Ω/C banana jack input.
3) Connect the red and black leads to the tested points. If the resistance value of the tested points is less than 30 Ω, you will hear beep sound from the test tool.

Then, the screen will look like the following figure 4-4.

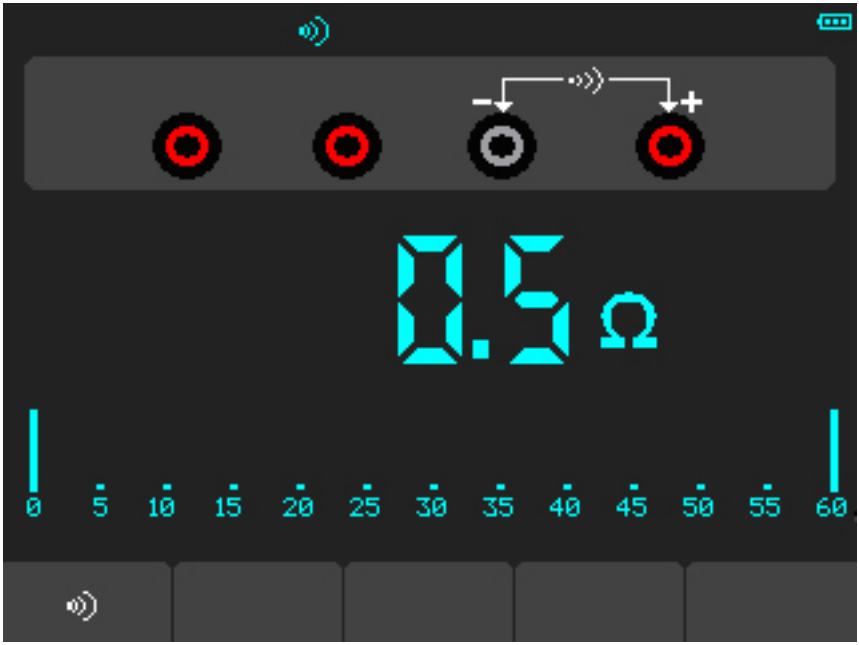


Figure 4-4 On-off Measurement

Making a Capacitance Measurement

To measure a capacitance, do the following:

1) Press the C key and a capacitor symbol appears on the top of the screen.
2) Insert the black lead into the COM banana jack input and the red lead into the V/Ω/C banana jack input.
3) Connect the red and black leads to the capacitor and the capacitance value is displayed on the screen in μF or nF.

Then, the screen will look like the following figure 4-5.

Figure 4-5 Capacitance Measurement

Making a DC Voltage Measurement

To measure a DC voltage, do the following:

1. Press the V key and DC appears at the top of the screen.
2. Insert the black lead into the COM banana jack input and the red lead into the V/Ω/C banana jack input.
3. Connect the red and black leads to the measured points and the voltage value of measured points is displayed on the screen.

Then ,the screen will look like the following figure 4-6.

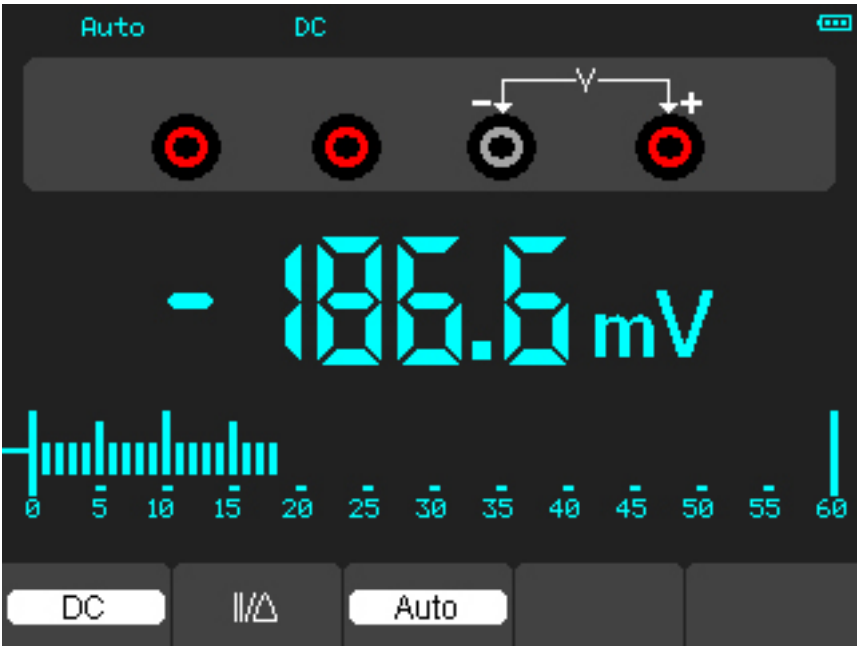


Figure 4-6 DC voltage Measurement

Making an AC Voltage Measurement

To measure the AC voltage, do the following:

1) Press the V key and DC appears on the screen.
2) Press the F1 key and AC appears on the screen.
3) Insert the black lead into the COM banana jack input and the red lead into the V/Ω/C banana jack input.
4) Connect the red and black leads to the measured points and the AC voltage value of measured points will be displayed on the screen.

Then, the screen will look like the following figure 4-7.

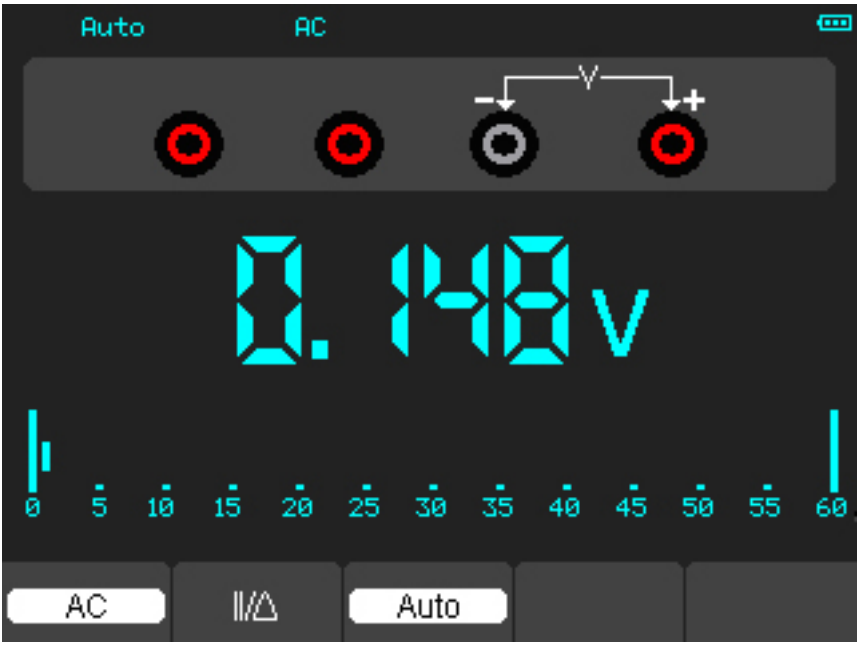


Figure 4-7 AC voltage Measurement

Making a DC Current Measurement

To measure a DC current which is less than 600 mA , do the following:

1) Press the A key and then DC appears on the screen. The unit on the main reading screen is mA. Press F2 to switch the measurement between mA and 10A. 600mA is acquiescently.
2) Insert the black lead into the COM banana jack input and the red lead into the mA banana jack input.
3) Connect the red and black leads to the measured points and the DC current value of measured points will be displayed on the screen.

Then, the screen will look like the following figure 4-8.

Figure 4-8 DC current Measurement for 600 mA

To measure a DC current which is larger than 600 mA, do the following:

1) Press the A key and then DC appears on the screen. The unit on the main reading screen is mA.
2) Press F2 key to switch to 10A measurement, the unit on the main reading screen is A.
3) Insert the black lead into the COM banana jack input and the red lead into the 10A banana jack input.
4) Connect the red and black leads to the measured points and the DC current value of the measured points will be displayed on the screen.
5) Press F2 to return to 600 mA measurement.

Then, the screen will look like the following figure 4-9.

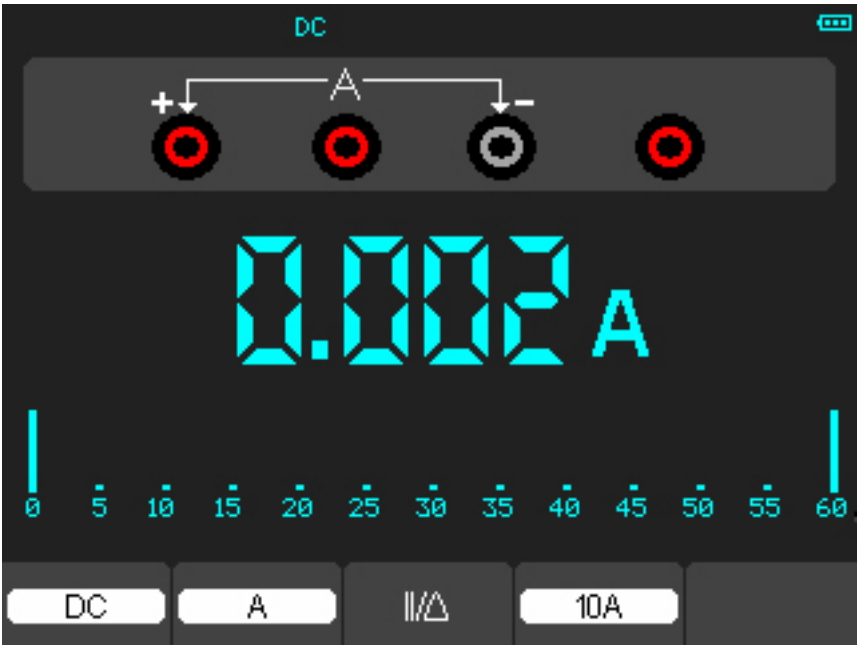


Figure 4-9 DC Current Measurement for 10A

Making an AC Current Measurement

To measure an AC current which is less than 600 mA, do the following:

1) Press the A key and then DC appears on the screen. The unit on the main reading screen is mA,and mA will display on the bottom of the screen, press F2 to switch the measurement between mA and 10A. 600mA is acquiescently.
2) Press the F1 key once and AC will display on the bottom of the screen.
3) Insert the black lead into the COM banana jack input and the red lead into the mA banana jack input.
4) Connect the red and black leads to the measured points and the AC current value of measured points will be displayed on the screen.

Then, the screen will look like the following figure 4-10.

Figure 4-10 AC Current Measurement for 600 mA

To measure an AC current which is larger than 600 mA, do the following:

1) Press the A key and then DC appears on the screen. The unit on the main reading screen is mA.
2) Press F2 key to switch to10A measurement, the unit on the main reading screen is A.
3) Press the F1 key once and AC will display on the bottom of the screen.
4) Insert the black lead into the COM banana jack input and the red lead into the 10A banana jack input.
5) Connect the red and black leads to the measured points and the AC current value of the measured points will be displayed on the screen.
6) Press F2 to return to 600 mA measurement.

Then, the screen will look like the following figure 4-11.

Figure 4-11 AC Current Measurement for 10A

Taking a Relative Measurement

A currently measured result relative to the defined reference value is displayed in a relative measurement.

The following example shows how to take a relative measurement. At first, it is required to acquire a reference value.

1) Press the Ω key.
2) Insert the black lead into the COM banana jack input and the red lead into the V/Ω/C banana jack input.
3) Connect the red and black test leads to the resistor. The resistance value is shown on the screen in Ohm.
4) When the reading leveling off, press F1 key and then ||/△ is displayed on the top of the screen. The saved reference value is displayed beside.

Then, the screen will look like the following figure 4-12.

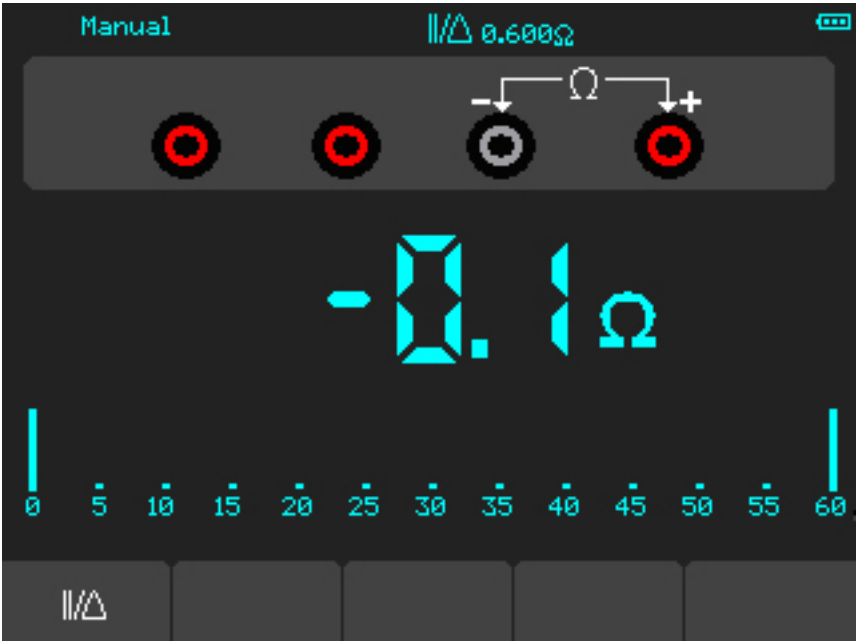


Figure 4-12 Relative Measurement

Selecting Automatic/Manual Range Adjustment

The default range mode of the instrument is automatic range. Suppose you are using the DC voltage mode, to switch to the manual range, perform the following steps:

1) Press F3 key to enter the manual range mode and then Manual is displayed on the top of the screen.
2) Under the manual range mode, the measuring range is increased by a stage when pressing F4 key each time, and when reaching the highest stage, it jumps to the lowest stage by pressing F4 key once again.
3) Press F3 key to switch back to the automatic range mode and then Auto is displayed on the top of the screen.

Attention: capacitance measurement without manual range mode.

Then,the screen will look like the following figure 4-13.

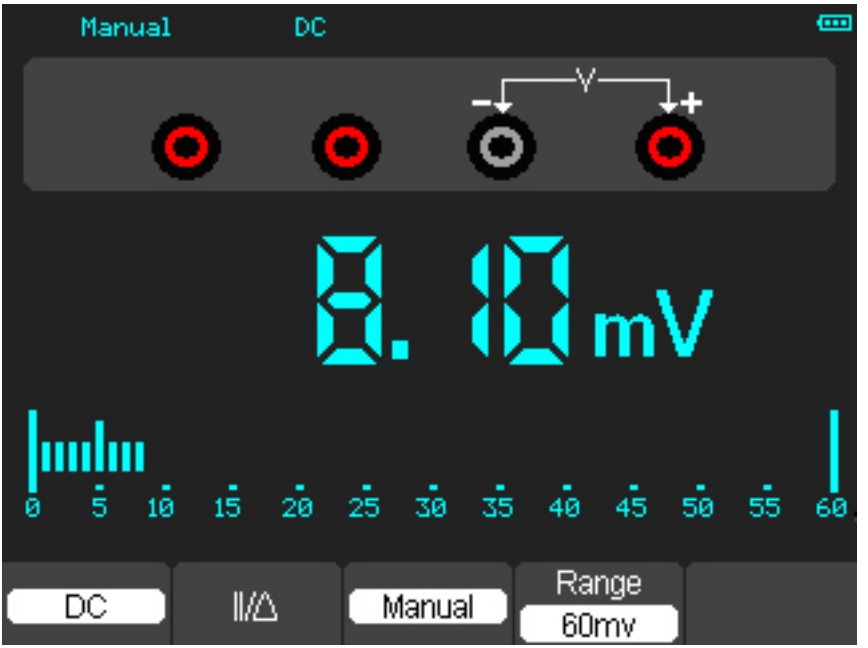


Figure 4-13 The Manual Range Mode

Chapter 5: Troubleshooting

1.The oscilloscope cannot start.

1) Check the power cable connection.
2) Ensure the power switch is turned on.
3) After the above inspection, restart the oscilloscope.
4) If the problem still remains, please contact us for help.

2. The measurement result is 10 times higher or lower than the value expected. Check if the probe attenuation is the same as the channel attenuation.

3. The waveform is displayed on the screen but is not stable under the oscilloscope mode.

1) Check the Trigger Source and notice if it is set to the channel in use.
2) Check the Trigger Type.

4. When select the average sampling in the sampling mode or select a long display time in the display mode under the oscilloscope, the display speed is slow.

It is normal in the above case.

Chapter 6: Specifications

Vertical

Channels	2
Bandwidth	DSO1060: 60MHz DSO1200: 200MHz DSO1600: 600MHz DSO1600H: 600MHz
Rise Time	DSO1060: 5.8ns DSO1200: 1.7ns DSO1600: 0.58ns DSO1600H: 0.58ns
Input Impedance	Resistance: 1M;Capacitance: 15pF
Input Sensitivity	DSO1060: 10mv/div to 5v/div DSO1200: 10mv/div to 5v/div DSO1600: 1mv/div to 5v/div DSO1600H: 1mv/div to 5v/div
Input Coupling	AC,DC with Ground Level Indicator
Vertical Resolution	8bits
Memory Depth	32k at single channel; 16k at dual channels
Maximum Input	300V(DC+AC Peak)

Horizontal

Sampling	DSO1060: 250MSa/s DSO1200: 500MSa/s DSO1600: 1GSa/s DSO1600H: 2GSa/s
Equivalent Sampling	50GSa/s
Time Base	DSO1060: 5ns/div~1000s/div
	DSO1200: 2ns/div~1000s/div
	DSO1600: 1ns/div~1000s/div
	DSO1600H: 1ns/div~1000s/div
Time Base Precision	±50ppm

Trigger

Source	CH1,CH2
Mode	Edge, Pulse Width, Alternative, Video.

X-Y Mode

X-Axis Input	CH1
Y-Axis Input	CH2
Phrase Shift	Max.3 degree

Cursors and Measurement

Voltage	Vpp,Vamp,Vmax,Vmin,Vtop,Vmid,VbaseVpp,Vamp,Vmax,Vmin,Vtop,Vmid,Vbase,Vavg,Vrms,Vcrms,Preshoot,Overshoot
Time	Frequency,Period,Rise time,Fall Time,Positive Width,Negative Width,Duty Cycle
Delay	Delay 1->2↑, Delay 1-2↓
Cursor	Manual,Track,Auto Measure Modes
Math	Addition, Subtraction, Multiplication, Division, FFT
Storage	15 Waveforms and setups

Meter Mode

Maximum Resolution	6000 Counts
DMM Testing Modes	Voltage,Current,Resistance,Capacitance,Diode & Continuity
Maximum Input Voltage	AC : 600V DC : 800V
Maximum Input Current	AC : 10A DC : 10A
Input Impedance	10MΩ

Meter Specification

Range		Accuracy	Resolution
DC Voltage	60.00mV(manual)	±1%±1digit	10uV
	600.0mV		100uV
	6.000V		1mV
	60.00V		10mV
	600.0V		100mV
	800V		1V
AC Voltage	60.00mV(manual)	±1%±3digit	10uV
	600.0mV(manual)		100uV
	6.000V		1mV
	60.00V		10mV
	600.0V		100mV
DC Current	60.00mA	±1.5%±1digit	10uA
	600.0mA	±1%±1digit	100uA
	6.000A	±1.5%±3digit	1mA
	10.00A		10mA
AC Current	60.00mA	±1.5%±3digit	10uA
	600.0mA	±1%±1digit	100uA
	6.000A	±1.5%±3digit	1mA
	10.00A		10mA
Resistance	600.0	±1%±3digit	0.1Ω
	6.000K	±1%±1digit	1Ω
	60.00K		10Ω
	600.0K		100Ω
	6.000M		1KΩ
	60.00M	±1.5%±3digit	10KΩ
Capacitance	40.00nF	±1%±1digit	10pF
	400.0nF		100pF
	4.000uF		1nF
	40.00uF		10nF
	400.0uF		100nF
	Attention:The smallest capacitance value that can be measured is 5nF.		
Diode	0V~2.0V		

Range		Accuracy	Resolution
On-off Test	< 10Ω		

Display

TFT LCD Type	5.7 Inch width LED Backlight Display
Display Resolution	240 (Vertical) X 320 (Horizontal) pixels

Interface

USB	USB 2.0
Optional	RS232,LAN

Power Source

Line Voltage Range	AC 100V ~ 240V, 50Hz ~ 60Hz; DC Input: 12VDC,1500mA
Battery Power(Installed)	6 hours(Li-ion Battery)

Mechanics

Dimension	245 x 163 x 52 (mm)
Weight	1.2 Kg

Other

GND Reference oscilloscope and Multimeter Independence

Caution

Technical specifications may be jubject to variations without notice

Chapter 7: Appendix

Appendix A: Accessories

1) Probe×2 (1.2m), 1:1, (10:1) Passive Probes
2) A Power Adapter that fits the standard of destination country
3) A User's Guide
4) A User Registration Form
5) A User Warranty Card
6) A Software CD

Appendix B: Warranty

We warrant our products' mainframe and accessories in materials within the warranty period. During the period concerned,
We guarantee the free replacement or repair of products which are approved defective. To get repair service or obtain a copy of the whole warranty statement, please contact with your nearest sales and service office.
We do not provide any other warranty items except the one being provided by this summary and the warranty statement. The warranty items include but not being subjected to the hinted guarantee items related to tradable characteristic and any particular purpose. We will not take any responsibility in cases regarding to indirect, particular and ensuing damage.

Appendix C: Maintenance

General Care
Do not store or leave the instrument in where the LCD display will be exposed to direct sunlight for long periods of time.
Caution: To avoid damage to the instrument or probes, do not expose them to sprays, liquids, or solvents.
Cleaning
If this instrument requires cleaning, disconnect it from all power sources and clean it with a mild detergent and water. Make sure the instrument is completely dry before reconnecting it to a power source.
To clean the exterior surface, perform the following steps:
1) Remove loose dust on the outside of the instrument and probes with a lint- free cloth. Take care to avoid scratching the clear plastic display filter.
2) Use a soft cloth dampened with water to clean the instrument.
Notice: To avoid damage to the surface of the instrument or probes, do not use any abrasive or chemical cleaning agents.
Storage of oscilloscope
If the test tool is to be stored for a long time, it is required to charge the lithium battery

before storage.

Charging the oscilloscope

The lithium battery is possibly not charged when delivery. To make the battery with enough electric quantity, it must be charged for 4 hours (the test tool must be turned off during charging). The battery can supply power for 6 hours after being charged completely.

To avoid superheat of battery during charging, the environment temperature is not allowed to exceed the permissible value given in technical specification.

Note:

No hazard will occur even connecting the charger for a long time, e.g. during a whole weekend. The instrument can automatically switch to slowly charging status.

Replacing the Lithium Battery Unit

It is usually not required to replace the battery unit. But when it is required to replace it, only qualified personnel can carry out this operation, and only use the same specification lithium battery.